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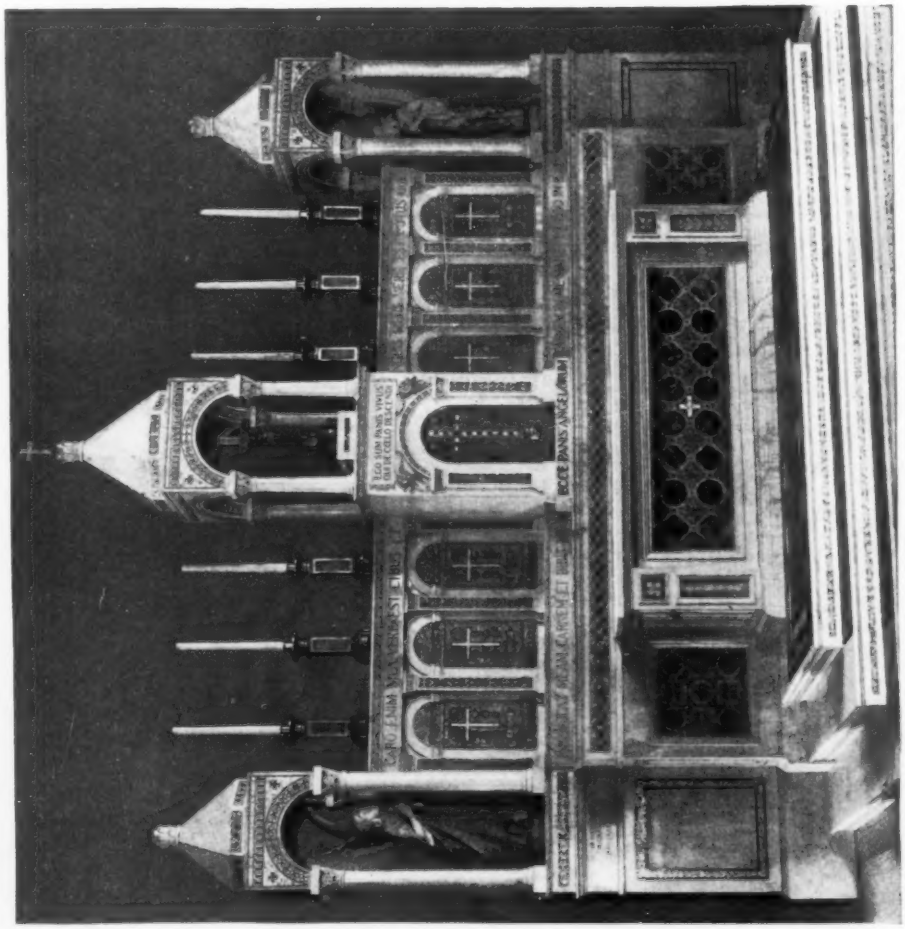

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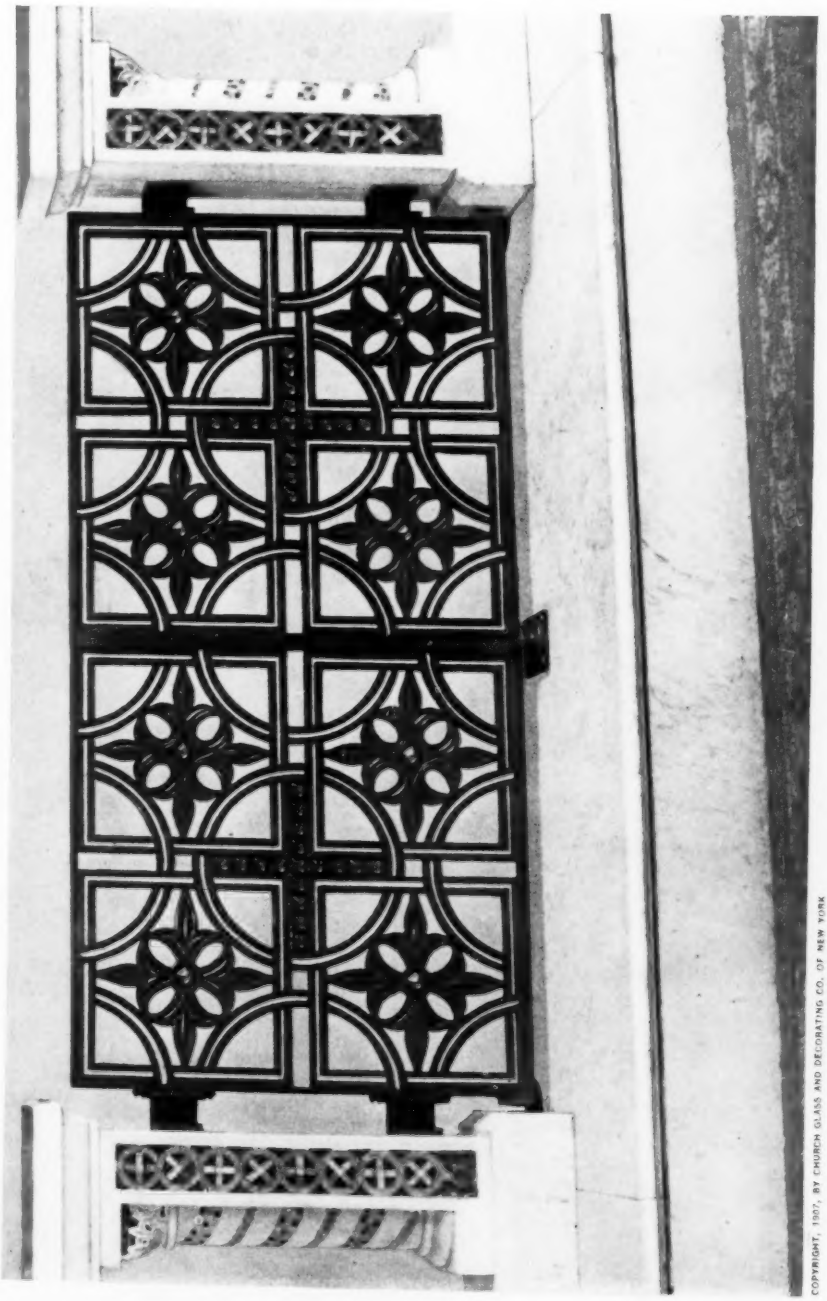

A SANCTUARY GATE IN WROUGHT BRONZE. FIFTH CENTURY MOTIF. ST. MALACHY'S CHURCH, PHILADELPHIA

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A LIGHT FROM THE GREAT CHANCEL WINDOW, TRINITY CATHEDRAL, CLEVELAND — TOD MEMORIAL — HARDMAN GLASS

The
Architectural Record

Vol. XXI JUNE, 1907. No. 6

The Discovery, by Professor Gustavo Giovannoni, of Curves in Plan, Concave to the Exterior, in the Façade of the Temple at Cori

Read Before the Archaeological Institute of America at Washington, January 2, 1907

The object of this paper is to call attention to the recent remarkable observations of curvilinear refinements in the Temple at Cori.

Prof. Gustavo Giovannoni, who has made these observations, is Assistant Professor in the Royal School of Engineering Architects at Rome, and at present holds the office of Vice-President in the Roman Society of Architects.[1] Aside from other publications, he is the author of an important monograph on the building popularly known as the Temple of Minerva Medica at Rome, designated by Professor Giovannoni as the "Sala Termale della Villa Liciniana."[2]

The attainments as an architectural surveyor and as an engineering expert and expert in construction which are implied in Professor Giovannoni's position as instructor in the Royal School of Engineers at Rome are additionally guaranteed by the technical precision of his monograph on the "Sala Termale della Villa Liciniana." The revolutionary importance of the observation to be described makes it more than usually necessary to mention, as above, the attainments, standing and expert character which are thus guaranteed in the observer. For in giving credence to the observation at Cori we are entering on unexplored territory; we are necessarily abandoning frequently quoted and widely credited explanations of the ancient curvilinear refinements in favor of other explanations which have been widely ignored. More than that, we are facing phenomena which must appear almost incredible to the every-day current knowledge of ancient art.

Hence an unusually circumspect and careful consideration of all the facts is to be desired. To this end, we shall first briefly describe the observation of Professor Giovannoni.

Second, we shall explain in what sense it is novel and remarkable.

Third, we shall rehearse the previously more or less well-known facts about the ancient curves and consider what special theories relating to them must be abandoned, at least as general and comprehensive explanations, in face of the newly discovered curves at Cori.

The announcement regarding these curves was originally made by Professor Giovannoni before a meeting of the Roman Society of Architects, which was held on the 6th of February, 1905. It was first published in the *Annuario* of the Society for that year. The additional facts to be related were then obtained

[1] Associazione Artistica fra i Cultori di Architettura, Roma.
[2] Annali della Società degli Ingegnere e degli Architetti Italiani. Fasciolo N. 3, 1904.

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through personal correspondence with Professor Giovannoni, who has also allowed me to describe and publish them.

I am advised by his letter of December 8, 1906, that the isolation of the Temple at Cori from adjacent buildings will be shortly undertaken by the Italian Government, and that this opportunity will be used for the construction of scaffolds which will enable him to take measurements in detail of the upper portions of the façade. Meantime, I quote from an earlier letter, of July 2, 1906, the following information:

"The Temple of Hercules at Cori belongs to the late epoch of the Roman Republic, and is one of the finest specimens of this period of transition from the Greco-Etruscan style to the Roman. The pronaos and the great door are still in almost perfect preservation and show splendid execution, both from the artistic and from the constructive point of view. The suspicion of accident (in regard to the curves) cannot be entertained.

"No one, however, as far as I am aware, has previously observed or measured the curve of the façade. This curve exists, notwithstanding, and is very clearly defined. The concavity (in plan), which is small at the columnar bases, where it measures 10 or 12 cm. deflection, increases to nearly 35 cm. in a length of m. 7.50 at the cornice. The gable follows the same line, and the regularity of the joints gives assurance that neither (original) accident nor subsequent movements have produced this remarkable deflection. There are no curves on the flanks."

As regards the measurements just quoted, it is to be observed that the curve of 10-12 cm. quoted for the bases, is one of unusually large deflection for the given length of m. 7.50, as compared with other classic curves; and that the curve at the cornice of 14 inches, or 35 cm., is far greater than any curve previously recorded for the ancient monuments, both as regards the actual measurement and still more as regards the relation of other smaller deflections to the greater widths or greater lengths of buildings.

Aside from the remarkable amount of the curve, its still more remarkable feature is the concavity in plan, and I need hardly remark that this feature constitutes its most astounding and novel characteristic. It is further to be noticed that no other Roman temple has been so far announced as showing any curves whatever, with the exception of the Maison Carrée, at Nimes, which has curves in the cornices of the flanks which are convex to the exterior.[3] See Fig. 2.

As the adjacent buildings interfere at Cori with a photograph sighting on the curve, the reader is advised to inspect Fig. 10 for an illustration of its nature.

Aside from the assurances given by Professor Giovannoni as to constructive intention, there are two evidences of such intention which speak for themselves, even to those who have not examined the temple, viz.: that the curve is found in the bases of the columns, and that a concave curved deflection in plan of the cornice and gable, to the extent of 14 inches, could not have been the result of accidental movements without the appearance of very visible and palpable dislocations in the connected structure, which must also have visibly affected the supporting columns, either at the angles or near the center, one or both.

As regards the theories which have been advanced to explain the ancient curves, the discovery of curves at Cori, concave in plan to the exterior, has a revolutionary and far-reaching significance. The optical effect above the level of the eye of a curve concave in plan is that of a curve in elevation—that is, of a curve in a vertical plane—which descends towards the center. Consequently, the explanation which has been so widely quoted and credited that the ancient curves were intended to correct optical effects of sagging downward is immediately and decisively thrown out of court in the case of the temple at Cori, for it is exactly an effect of sagging downward

[3]The constructive existence of these curves has been verified by the official architect of the City of Nîmes and also by his predecessor in the same position. See Smithsonian Reports for 1894 (published in '96). "A discovery of horizontal curves in plan in the Maison Carrée at Nîmes." Under the same title see also the American Journal of Archaeology, Vol. X., No. 1 (1895); and the Architectural Record, Vol. IV., No. 4 (1895).

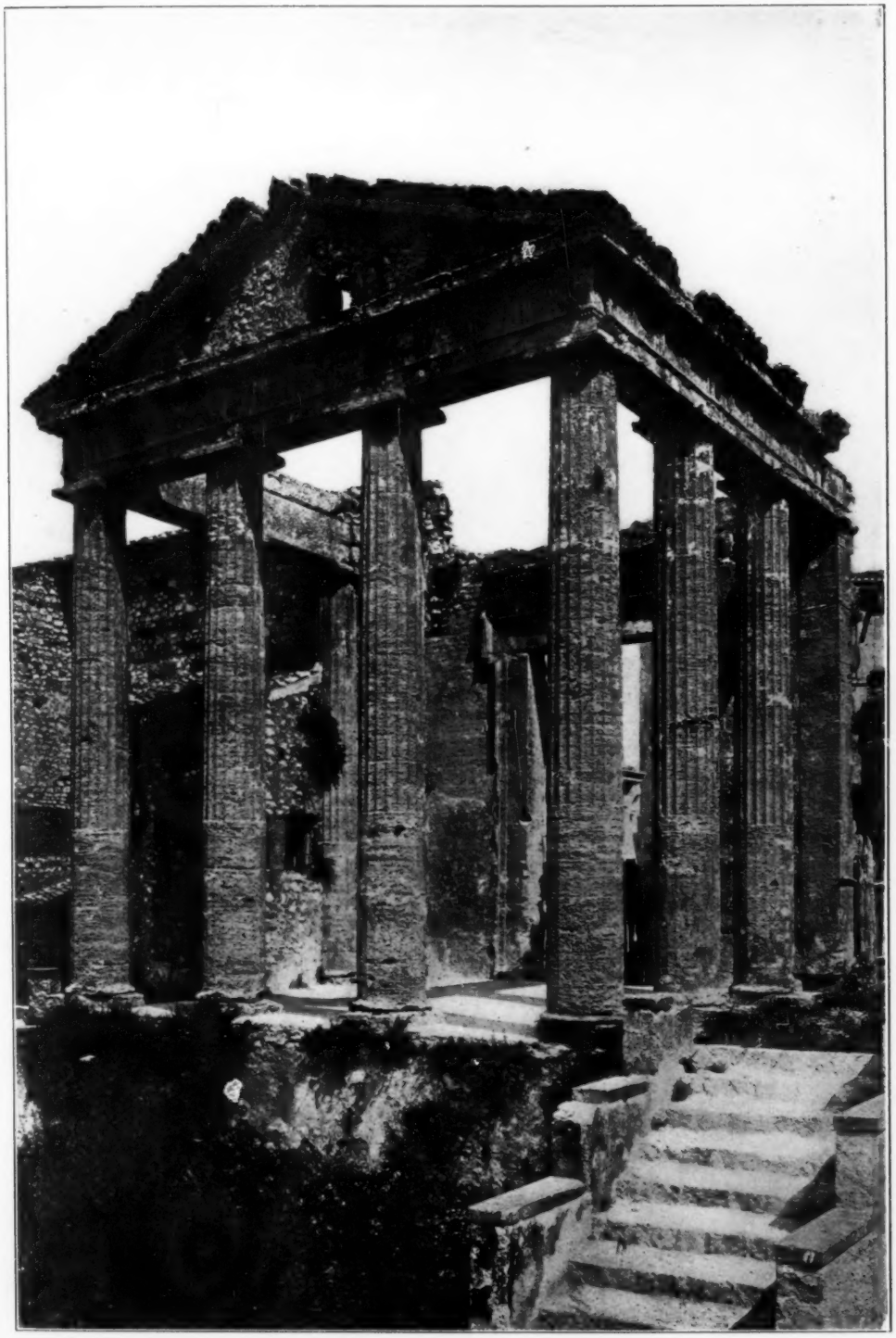


FIG. 1. THE TEMPLE OF HERCULES AT CORI.
As the adjacent buildings interfere with a view of the curve, its character is illustrated by Fig. 10.

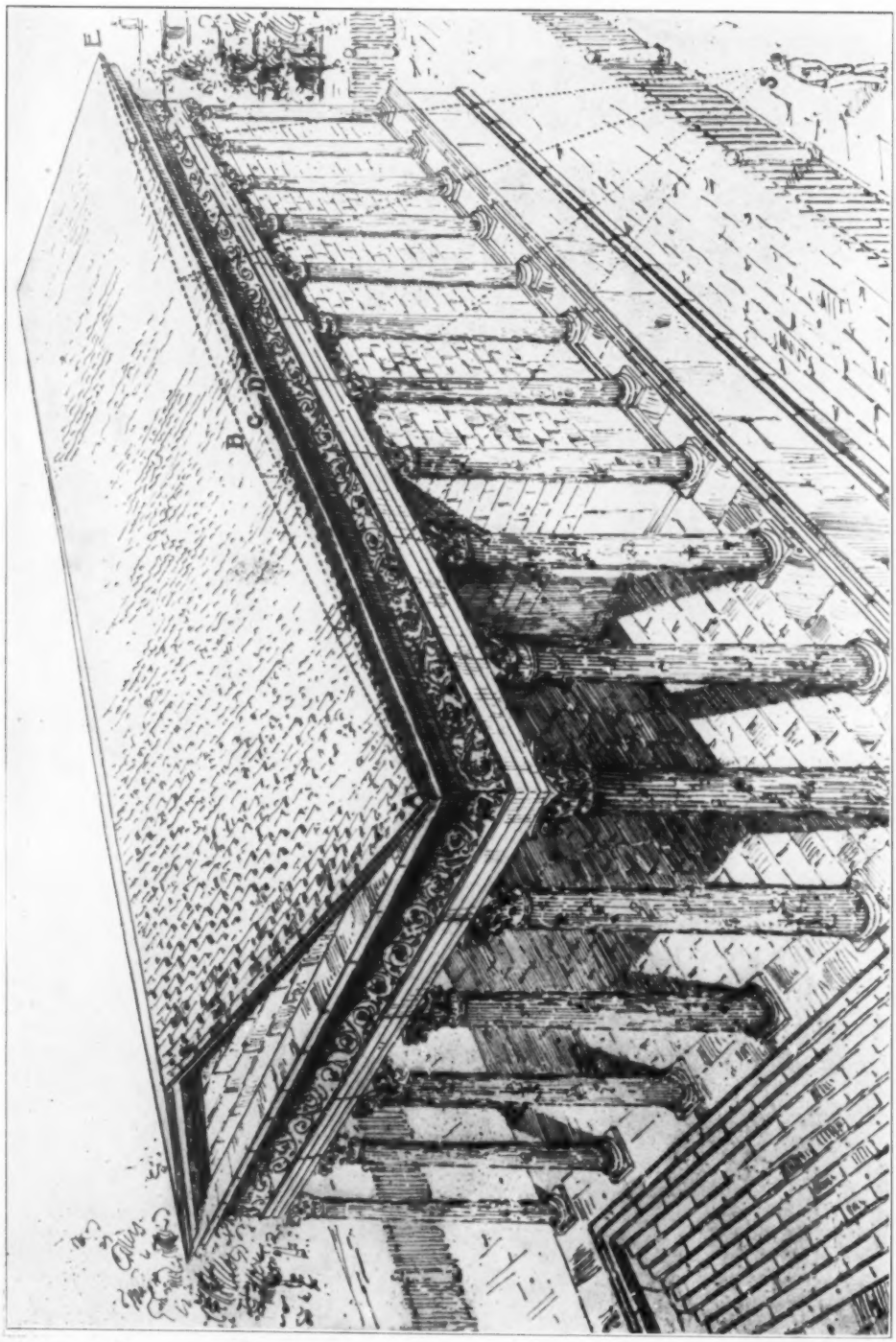


FIG. 2. BIRD'S-EYE VIEW OF THE MAISON CARREE AT NIMES.

The upper dotted line suggests the optical effect of the curves in plan, convex to exterior, which are found on the flanks of this temple (deflection about five inches). From a drawing by John W. McKecknie.

The upper dotted line suggests the optical effect of the curves in plan, convex to exterior, which are found on the flanks of this temple (deflection about five inches). From a drawing by John W. McKecknie.

FIG. 3. THE TEMPLE OF JUNO LACINIA (SO-CALLED) AT GIRGENTI.
From a photograph of the Brooklyn Museum Survey of 1895. Straight lines have been drawn on the negative to exhibit the rising curves in elevation of the stylobate and entablature.

which is actually produced by this curve, as far as the upper horizontal lines are concerned.

So conclusive an argument leads us to examine the previous standing of the widely spread impression that the Greek curvilinear refinements were intended universally to correct optical effects of sagging, and thus cause the lines to appear straight. This explanation is frequently quoted for the rising curves in elevation, such as are found in the Parthenon and some other Greek temples; and these are the curves which have so far absorbed the attention of the majority of experts (Figs. 3, 4, 7). It is true that different curves may have been employed in different buildings for different reasons. It would be establishing a very important fact, if this fact alone were established by the instance at Cori, but the opportunity is a convenient one to point out that the widely quoted explanation is essentially a popular misapprehension of an entirely different proposition, and that this widely quoted explanation has never been mentioned by any of the optical experts who have written special publications on the Greek curves.

It is a popular modern prejudice that architectural lines ought to *be* straight. It is consequently a proposition which instantly appeals to the popular mind that the Greeks curved their architectural lines in order that they might *appear* straight. Hence, probably, the widely quoted but really mistaken proposition that all horizontal architectural lines tend to sag, optically, at the center. This impression among architects may be due to the occasional practice of cambering interior flat ceilings, or tie-beams under a gabled roof, but the problem of optical effects in such interiors has no relation to the general but mistaken proposition.

It is an elementary proposition in perspective that horizontal lines above the level of the eye curve downward toward the extremities on near approach. This elementary proposition is most easily realized by assuming the position of the spectator to be opposite the center of a building of such dimensions that the head has to be turned first in one direction and then in the other in order to take in the entire upper line. As the really horizontal upper line to the left of the spectator will descend optically in perspective towards the left, and as the really horizontal upper line to the right of the spectator will descend optically towards the right, it is manifest that the eye, in passing from left to right, or from right to left, must see the whole horizontal line optically as a curve descending towards the extremities and highest in the middle. It is equally true that all lines which descend in perspective in a single direction must descend in a curve, optically speaking, because the line which is really straight and horizontal descends in gradually increasing amount, according to the distance from the eye. Consequently an actually horizontal straight line which, optically speaking, changes direction from point to point must necessarily change direction, optically speaking, in a curve. It is only the mental knowledge that the line is really straight and horizontal which interferes with the perception that the line is really seen as a curve.

The interference of a mental conviction based on general positive knowledge, with an actual optical appearance, is a well established fact. This interference of the brain with the true facts of vision has been ably described by Professor Guido Hauck in a publication to be presently quoted. Professor Hauck found that the ability to see the rising curves which optically exist in all horizontal lines above the level of the eye (unless interfered with by other lines) was strongest in women and in the persons whom he calls "Naturmenschen," among whom he includes artists; whereas persons with mathematical and scientific training were frequently unable to see the curves at all. He also found in his own experience a progressive improvement in his ability to distinguish the curves as actually seen by the eye. He also found that optical curves in lines really straight and horizontal could be seen in a line of separated lights illuminating an architectural line at night, when they could not be seen in the same architectural line by daylight. The mental conviction had an effect on the con-

FIG. 4. THE TEMPLE AT EGESTA.
Showing the rising curve in elevation of the stylobate. Photograph of the Brooklyn Museum Survey of 1885.

tinuous line which did not occur with separated points of artificial light not visibly connected by the architectural line.[4]

All these facts assist us to understand why lines which are optically seen as curves are not generally recognized as curves by the every-day human being. They also enable us to understand that

cording to training. As a matter of fact, there is no perspective which is not curvilinear, but as these perspective curves are too delicate to be generally represented in the dimensions of pictures, instruction in perspective, as regards draughtsmen and painters, generally ignores them, and hence does not tend to counteract the average human indiffer-

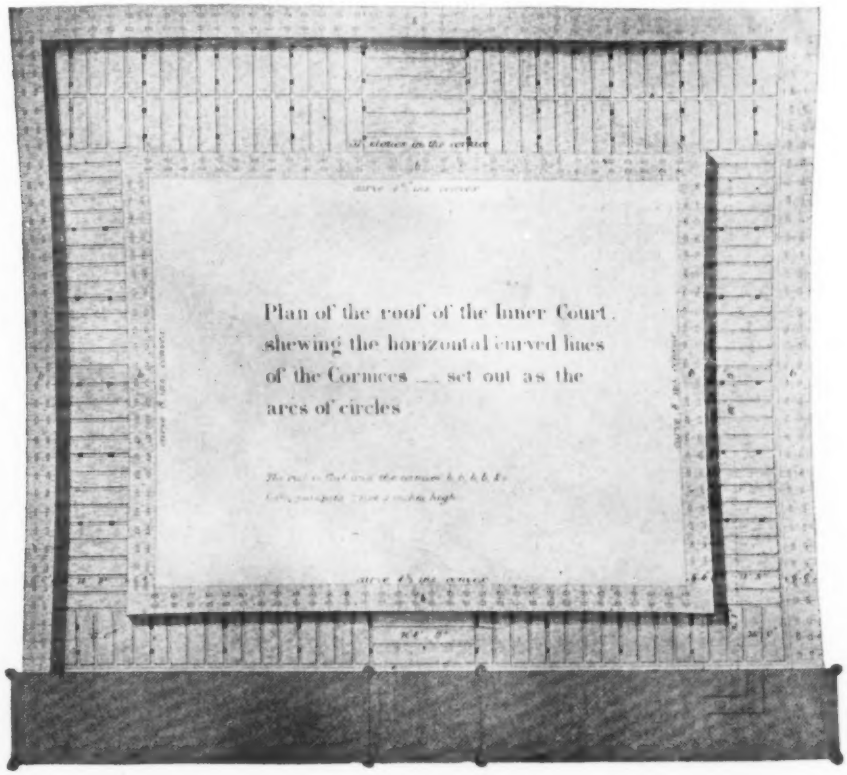


FIG. 5. PLAN OF THE ROOF OF THE INNER TEMPLE COURT AT MEDINET HABOU, THEBES.
From Pennethorne, "Geometry and Optics of Ancient Architecture.

the perception of the curves which are optically present in the facts of vision varies according to temperament and ac-

ence to their existence, which is due to mental correction.

All these points bear on the popular

[4]The mental corrections of optical appearances which are described by Professor Hauck have a curious analogy in the experience of Mr. John W. Beatty, M. A., Director of Fine Arts in the Carnegie Institute at Pittsburgh, Pennsylvania. The following extract from his letter to me on this subject is published by his permision:

"Briefly put, my experience was this: When I first put on glasses for astigmatism, perpendicular lines appeared not parallel, being wide at top; in the size of a newspaper page, about one and one-half inches wider than normal. When I had worn the glasses for several months, lines seemed again parallel. Now, when I take the glasses off, lines are again not parallel, but *wider at the bottom.*

"Dr. Lippincott's theory was that I had always made mental correction, and lines recorded on the retina out of parallel were made to appear parallel by virtue of mental correction. This seems to be absolutely proven by the history of the case, as above briefly outlined.

"When I take the glasses off now, I see lines imperfectly at the instant of time, because the brain is not given time to correct the defect.

"The fact that the greater width is now at the bottom, without glasses, whereas it was at the top with glasses when they were first used, is significant. You will find the reference to my case in the Archives of Opthalmology (Vol. XVIII.) p. 18 and more particularly, p. 28."

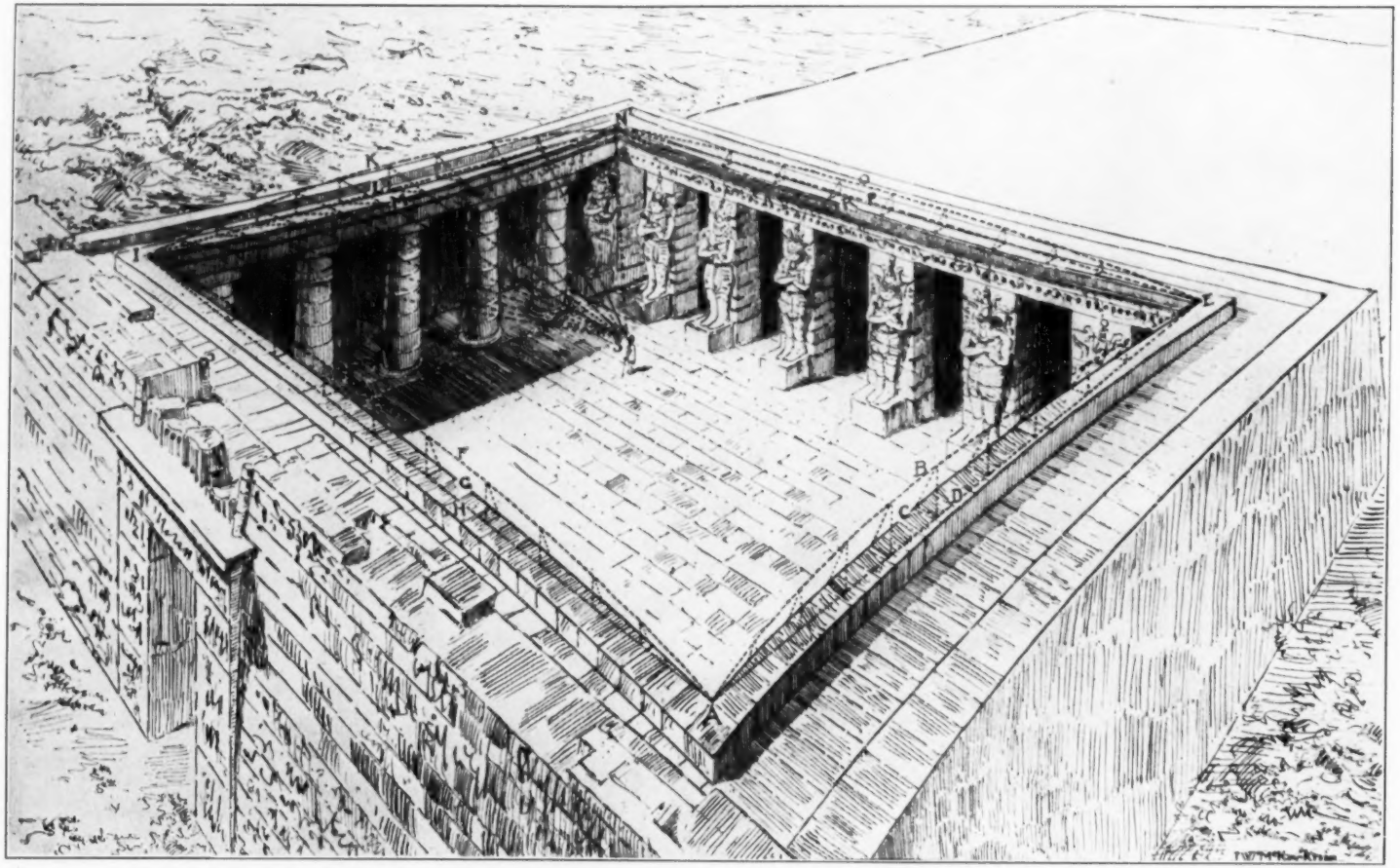


FIG. 6. BIRD'S-EYE VIEW OF THE INNER TEMPLE COURT AT MEDINET HABOU, THEBES.
From a drawing by John W. McKecknie. The upper dotted lines show the optical effect of the curves in plan as seen from an angle of 45° inside the court.

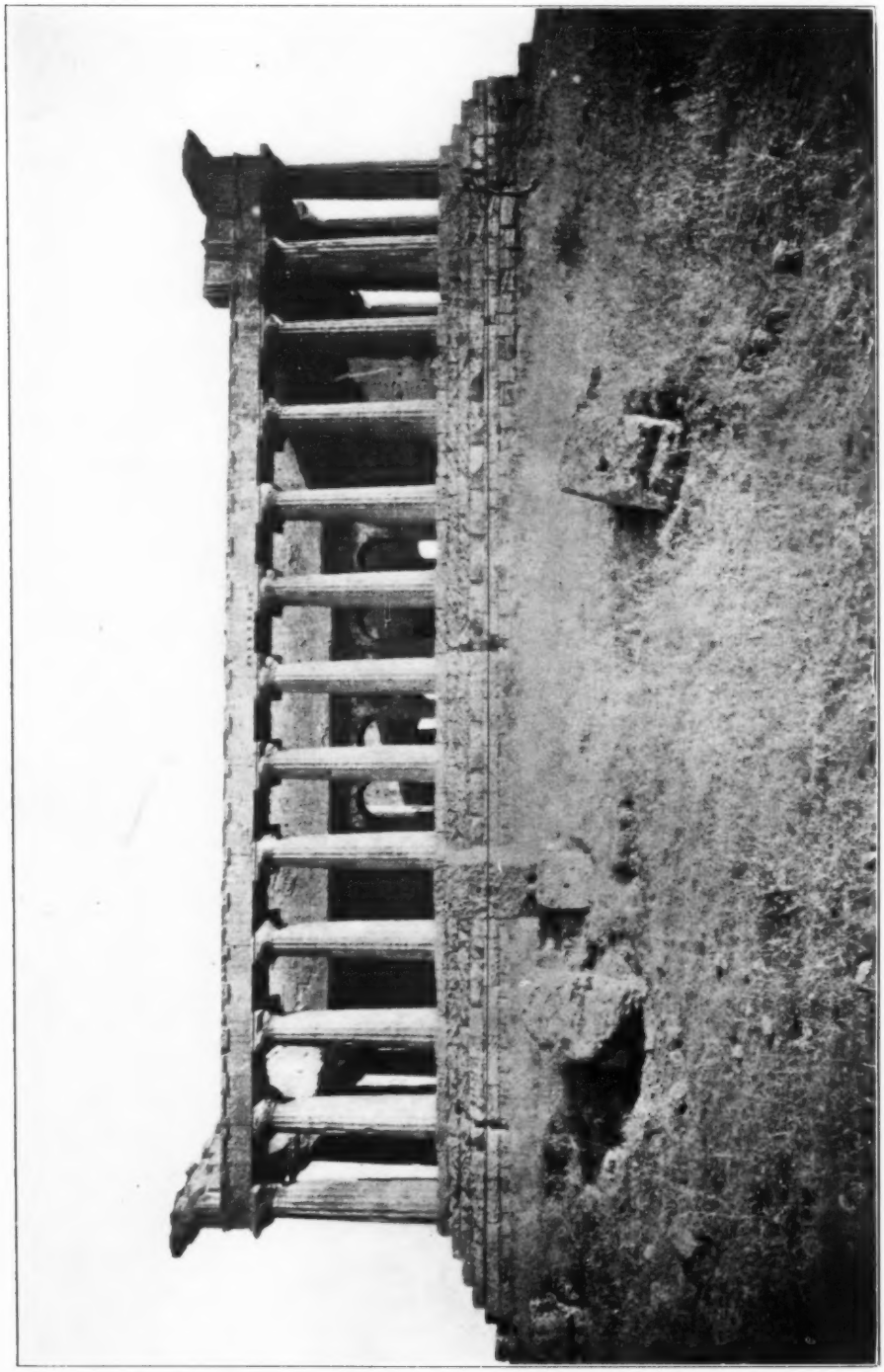


FIG. 7. THE TEMPLE OF CONCORD (SO-CALLED) AT GIRGENTI (NORTH SIDE).
From a photograph of the Brooklyn Museum Survey of 1895. Straight lines have been drawn on the negative to exhibit the rising curves in elevation of the stylobate and entablature.

FIG. 8. WEST FRONT OF THE TEMPLE OF CONCORD (SO-CALLED) AT GIRGENTI.
In parallel perspective. Illustrating the absence of curvature in the entablature, under the gable. Photograph of the Brooklyn Museum Survey of 1895.

error that there is a natural sagging effect in architectural horizontal lines above the level of the eye, and it is now our mission to point out that no optical expert who has made a special study of the Greek curves has ever suggested that such a general sagging effect exists.

Thus the first investigator who made publication on the subject supposed that the Parthenon curves were intended to accent and increase perspective effect, because they develop and accent a form of curve which already exists in the normal optical appearance. This investigator was Hoffer, whose observations, measurements and publications were made in 1838, and thus anticipated the earliest observations of Penrose by seven years and anticipated his publication by thirteen years.

Hoffer's publications were made in the "Wiener Bauzeitung" for 1838, whereas Penrose did not visit Athens till 1845 and did not publish his "Principles of Athenian Architecture" until 1851. The discovery of the Parthenon curves by Pennethorne, in 1837, is generally supposed to have preceded the observations of Hoffer, but the publication of Hoffer long preceded that of Pennethorne, which appeared in 1878.

It will be observed that I am not advocating at present the explanation of Hoffer; I am simply pointing out that he was the first expert who made a special publication on the Greek curves, and that, so far from suggesting that these curves were intended to correct an effect of sagging, he supposed that they were intended to enhance and exaggerate a curve of exactly contrary character, and that this curve was mentioned by him as the ordinary optical appearance due to perspective.

The popular impression that the rising curves were intended to correct an effect of sagging, popularly said to be inherent in horizontal lines generally, is probably simply a misapprehension of the theory of Penrose, who never, however, suggested any such appearance in horizontal lines as a general rule. Penrose rested his theory of correction on the optical tendency of a horizontal cornice to curve downward under a gable, because the angles of the gable tend to appear wider than they actually are; therefore the bottom line appears depressed, and as the appearance of depression gradually decreases according to distance from the angles, therefore the optical effect is a downward curve. According to Penrose, the rising curve under the gable was to correct this effect. But as far as the flanks are concerned Penrose supposed the curves to be explained by the sentiment of beauty and the appearance of strength, but to have been originally suggested by the application of the curve as an optical correction under the gable. Thus we are led next to ascertain the present standing of the gable theory of Penrose, which appears to be the original form of the debated popular impression, although it is really a wholly distinct proposition.

This leads us to consider what other authorities later than Penrose have had to say about his gable theory. This gable theory has never, to my knowledge, been accepted or even favorably mentioned by any German authority. On the contrary, it has been vigorously and successfully contested by both of the two greatest German authorities who have subsequently debated the curves from the standpoint of the expert in optics. First, Thiersch[5] added to a variety of solid arguments one which must appeal to every understanding, whether that of an expert or otherwise. The argument is, namely, this: If Penrose was correct in believing that the curves of the entablature and cornice at the ends of the temple were intended as an optical correction under the gable and to make the lines appear straight, how does it then happen that the stylobate is curved also, for which no such gable effect occurs? This argument is unanswerable. The only objection to it is that it is so simple, so conclusive, and must be so briefly stated, that it falls short of effect from sheer simplicity. It is, however, gilding the lily to elaborate this argument. It is not necessary here to rehearse the alternative suggestion of Thiersch, who

[5]Optische, Täuschüngen auf dem Gebiete der Architectur. Zeitschrift für Bauwesen. Vol. XXIII., Ernst und Korn, Berlin, 1873.

thus and otherwise contested the gable theory of Penrose, because it has also been thrown out of court by two subsequent publications. One of these publications was that of Guido Hauck.[6]

Although Hauck abandoned the new explanation of Thiersch, he approved, rehearsed and elaborated the arguments which led Thiersch to reject the theory of Penrose, especially dwelling on the point that the stylobate need not have been curved if the object of the curve was to correct a deflection under the gable. Both Thiersch and Hauck also urge the sensible view that to consider the curves of the entablature on the flanks of a temple as purely an afterthought is a far-fetched and wholly unsupported hypothesis. Let it be also observed that the theories of Thiersch and Hauck, which proposed to supplant the theory of Penrose, make no reference to a general sagging effect in horizontal lines, and Hauck expressly develops the fact that horizontal lines above the level of the eye tend normally to curve downward toward the extremities instead of curving upward toward the extremities, as they would if they had a sagging effect. Thiersch alludes to the same fact as holding for near approach.

The publication of Hauck is undoubtedly the most valuable and far-reaching contribution to the optics of rising curves in elevation which has ever been made. But as an explanation of the subject of curvilinear refinements, viewed as a whole, it has also been thrown out of court. Therefore I need not describe the theory of Hauck. It is sufficient to say that it is based, like the theory of Thiersch, on the form of the Greek temple and on the idea that the curves were invented by the Greeks, and that these curves were always rising curves in elevation.

Neither Thiersch nor Hauck were acquainted with the *curves in plan* of the cornice, convex to the center of the court, in the second Temple Court of Medinet Habou. These curves were discovered by Pennethorne in 1832, but he did not publish them until 1878. This was only a year before Hauck's publication, and the Egyptian curves were still unknown to Hauck in 1879. If the gable theory of Penrose required a final death-blow, it would be furnished by the curves in plan of the second Temple Court of Medinet Habou, where there are naturally no gables. But the curves in plan at Medinet Habou also throw out of court the special theories of both Thiersch and Hauck, and this is why I have not explained them. It will not be overlooked, however, that the optical effect in the cornices at Medinet Habou is that of a rising curve in a vertical plane. At the angle of 45 degrees the spectator has the effect of a rising curve in elevation of an amount equal to that of the curve in plan. At points farther removed the curve appears less. At nearer points the effect is greater and increases enormously on close approach. Thus on close approach the normal perspective curve is much exaggerated.[7]

Still another argument against the gable theory of Penrose is furnished by

[6]Die Subjective Perspektive und die Horizontalen Curvaturen des Dorischen Styls. Dr. Guido Hauck, Stuttgart, Conrad Wittwer, 1879.

[7]The theory of Thiersch, briefly stated, moves from the illusion which tends to affect the appearance of two lines meeting at an angle. These effects were quoted by Penrose for acute angles, as calling for a correction under the gable. Thiersch, however, points out that, whereas acute angles appear larger than they really are, obtuse angles appear smaller. His arguments contend that the direction of Vitruvius regarding the construction of the curves was limited to those temples which stand on an elevated platform above the level of the eye. Thus the Parthenon, as seen by a spectator *looking toward one of the angles*, would exhibit obtuse angles both in the stylobate and in the entablature (with the apex of the angle turned toward the spectator). These angles would appear smaller than they are, and as this effect decreases with the distance from the angle, the lines would appear to curve downward away from the angle. This effect would be corrected by a rising curve in elevation. Hauck contested this explanation on the ground that the optical deflection of the obtuse angle was so inconsiderable that a correction would not be needed, but more particularly because such a correction would in any circumstance only be needed for the spectator looking toward the angle of the building, and would not be needed in views facing the front or sides. Hauck based his own theory on the fact that the intercolumniations of the Parthenon are smaller at the angles, by about two feet, in order to admit of placing the corner metopes at the angles of the building, instead of placing them over the centre of the abacus, where they normally appear. This diminution of spacing gives an increase of perspective from the point of view facing any side of the temple from positions nearly opposite the centre. Hence, according to Hauck, if the perspective rising curves in elevation were not also correspondingly increased, the perspective effect of the columns would be out of harmony with the perspective effect of the horizontal lines. Thus Hauck in a sense returned to the explanation of Hoffer. For although he held that perspective exaggeration, for its own sake, would not have been in line with Greek feeling, he also held that this perspective exaggeration was properly sought in view of the contradictory effects

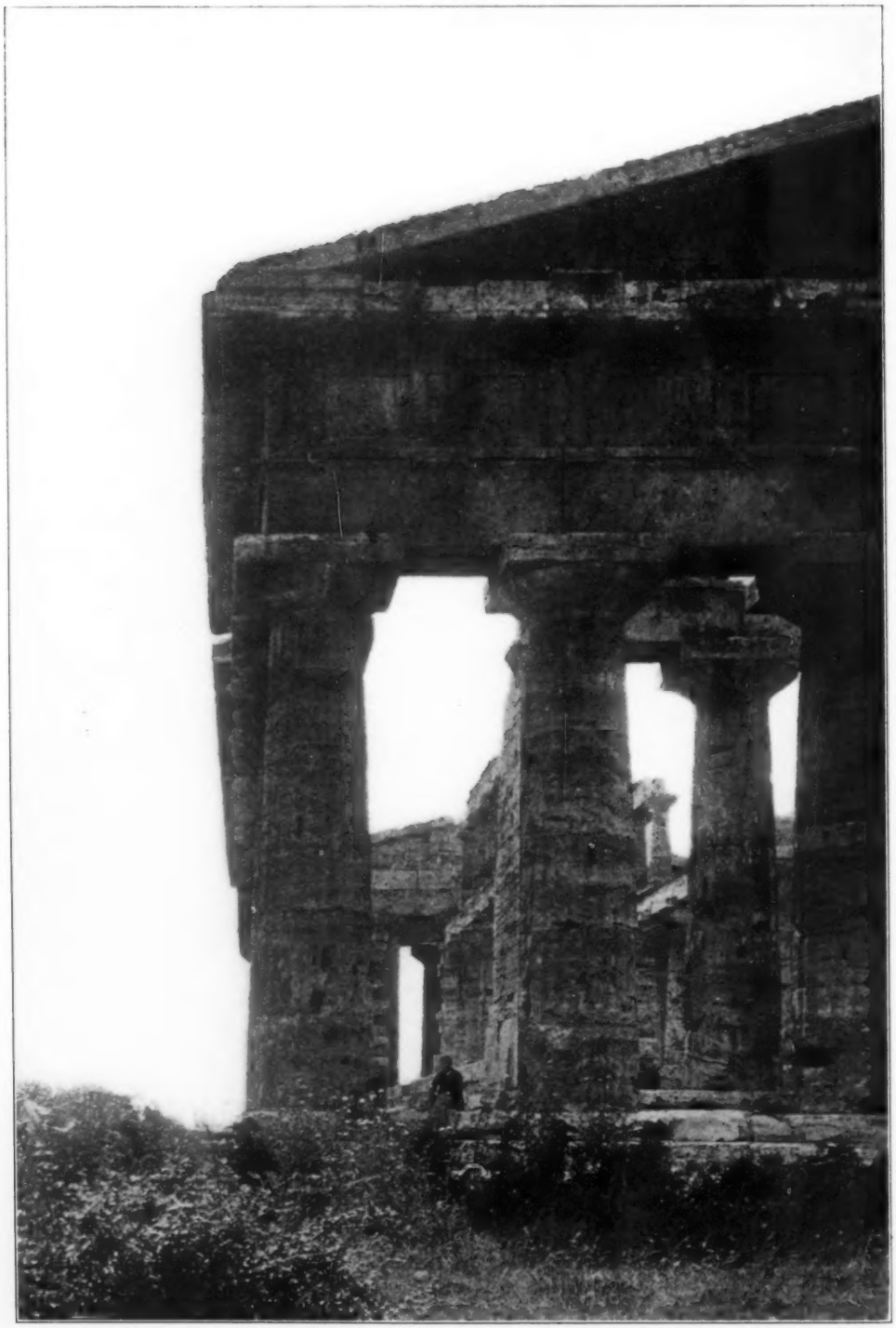


FIG. 9. CURVE IN PLAN, CONVEX TO EXTERIOR, SOUTH SIDE OF THE TEMPLE OF NEPTUNE (SO-CALLED) AT PAESTUM.
Photograph of the Brooklyn Museum Survey of 1895.

the Brooklyn Museum surveys of 1895. The photographs, taken under my direction, of the Temple of Concord, at Girgenti, show that there are rising curves in elevation on the flanks, but no curves under the gable. Hence the curves of the flanks could not well be an afterthought, derived from the curves under the gables, since the latter do not occur in this temple. This very important argument against the gable theory of Penrose has never previously been adequately published. (See Figs. 7, 8.)

Penrose had based his argument for the derivation of curves on the flanks of a temple from the curves under the gable, on the high antiquity of the Neptune Temple, at Pæstum, and on the supposed fact that this temple had curves under the gable, but none on the flanks. Thus, for Penrose, the Neptune Temple represented the primitive stage of the Greek curves, but he was ignorant that Jacob Burckhardt, in his "Cicerone," has announced constructive curves in plan convex to exterior on the flanks of the Temple of Neptune. These curves were photographed for the first time by the Brooklyn Museum surveys of 1895 (Fig. 9).

From the preceding summary two results are fairly well established. First, the popular impression that the Greek curves were intended to make the lines look straight, and to correct effects of sagging supposed to be inherent in straight lines above the eye, is without authority, as far as the quoted experts are concerned, and the theory of Burnouf,[8] in the "Revue Generale de l'Architecture" for 1875 is too fanciful to require more than passing mention here. The second result is this: As far as Penrose is concerned, he only suggested a sagging effect under the gables at the ends of a temple as the explanation of the curves. Against this theory the following points may be urged: It has not been accepted nor favorably mentioned by any French or German expert; it has been vigorously opposed by two distinguished experts in optics, and the theory

otherwise produced by the necessary narrowing of the angle intercolumniations.

As the title of Professor Hauck's monograph indicates, he supposed that the Greek curves were confined to the Doric style, in which style alone the angle intercolumniations were reduced, in order to allow the triglyphs to be placed at the angles of the temple. Since that date the discovery of curves in the Ionic temple at Pergamus would have vitiated his theory, but it is also wholly unavailable for the interior curves of the second Temple Court at Medinet Habou, which are convex in plan, to the center of the court. As far as the theory of Thiersch is concerned the openings of the obtuse angles in the interior of the court at Medinet Habou are turned toward the spectator, not away from him (as in the exterior of a Greek temple). The angle illusion, if any were produced, would, therefore, be a rising curve in elevation and would thus need no correction. Although the theories of Thiersch and Hauck are no longer tenable, their publications still have great interest and importance as *critiques* of the theory of Penrose, and otherwise.

It ought perhaps to be added that the theory of Thiersch is the only one which has ever even been offered to explain the account of Vitruvius. Although the explanation of Vitruvius has been otherwise universally discarded; or (more generally) ignored, the meaning of the explanation certainly ought to be susceptible of explanation, even if it were not correct. Vitruvius directs that the stylobate of the temple shall be built with a rising curve in elevation, lest it appear "alveolated" (like the bed of a channel) and the curves of the entablature are considered as a mere outcome or logical sequence of the stylobate curve. Thiersch moves from the fact that Vitruvius is speaking of temples resting on a *podium*, that is above the level of the eye of the exterior spectator and that the effect of sagging from the exterior point of view was to be counteracted by the curve. I will venture to suggest that Vitruvius is speaking of an effect of "alveolation" for the spectator standing on the platform. It is a logical result of the laws of curvilinear perspective that all plane surfaces below the level of the eye must tend optically to "dish," that is to appear like a dish or bowl. Aeronauts find this appearance in the earth's surface when raised above it in a balloon, for the same optical reason. The same optical laws explain the dome-shaped appearance of the sky. Thus, although the explanation of Vitruvius is certainly insufficient to cover the known facts, it appears to be a common-sense and practical explanation, which deserves recognition and mention, among the many which have been offered. The explanation of Vitruvius is additionally interesting from the fact that it is not simply the outer porticos of the Parthenon which have the stylobate curves. The entire platform of the temple is delicately hemispherical or, as the French would say *bombe*.

[8]Even the briefest mention of Burnouf ought not, however, to omit to give him credit for having, alone among modern authors, given the correct explanation of the *scamilli impares* of Vitruvius. Penrose supposed that the *scamilli impares* were the drums of the columns which rested on the stylobate. These drums, in the Parthenon, are of unequal height on opposing sides. Otherwise the columns resting on the curved and sloping surface would lean away from the centre of the temple. This interesting proof of the intended construction of the curves is not, however, the true explanation of the *scamilli impares*, by means of which the curves were to be constructed. Even in the second edition of his "Principles of Athenian Architecture," published in 1888, Penrose was still ignorant of the obviously correct explanation offered by Burnouf in 1875. It is significant of the general neglect by archaeologists of the subject of Greek curves that Burnouf's explanation has not even been alluded to by any other authority.

Burnouf points out that *scamillus* is a diminutive of skamnon and may be translated as "a little stool"—Burnouf says *un petit banc*. These little stools were the small pyramid-shaped sighting blocks which are still used in France for levelling a line of steps or a masonry platform. If placed in graded unequal sizes, gradually increasing in height from the centre toward the extremities of the line of steps, such *scamilli* could be used for constructing a curve and, as Burnouf says, it was as easy in antiquity to construct a curve with these implements, as it now is to build to a level. He also mentions that such *scamilli impares* must have been used for building curves in plan.

of Hoffer is also opposed to it in principle; it is finally thrown out of court by known facts in Egypt and at Girgenti.

We are now able to return to the discovery of Professor Giovannoni at Cori.

Popular impressions are not so easily blighted as scientific or archæologic theories. Every man in the street who has heard of Greek curves will tell us that they were meant to make the lines look straight, and will so continue to tell us long after the publication of Professor Giovannoni's discovery. But considered as a scientific or archæologic theory, the discovery at Cori disposes of the gable theory of Penrose for all time as a general or universal explanation of the classic curves, for the simple reason that this curve produces a sagging effect in the upper horizontal line, and therefore could not counteract one.

But the discovery does far more than this; it forces a revision of most of the other theories on Greek curves and widens our views regarding them to a very remarkable extent. And before I take up this phase of the subject I wish to point out the possibility that the curves at Cori may not be the only ones which are concave to the exterior, even in existing classic monuments.

Pennethorne observed curves *in plan* concave to the exterior in the upper entablature at the ends of the Parthenon. Hoffer explicitly described the same curves and measured them. The plan of these concave curves, with measurements, is published in the "Wiener Bauzeitung" of 1838. Hoffer described these curves in plan as beginning in the capital, as continuing in the entablature and cornice, but as not being found in the tympanum. They amount to about two inches only at the cornice. Penrose quotes the observation of Pennethorne and gives his reasons for believing the curves to be accidental. In deference to Penrose, Pennethorne, in 1878, adopted his view that these curves were accidental. The argument of Penrose is that the gaps between joints were greater in the rear than in the front. Hoffer's observation that the tympanum surface is a straight line would appear to suggest that the curves above and below it could hardly be due to accidental movement. No decision on such a head can be reached or even suggested in this paper, and the explosion which ruined the Parthenon is not to be forgotten, but it is surely worth remembering, in face of the concave curves at Cori, that concave curves in the Parthenon gable fronts were observed, measured and published in 1838 by Hoffer as constructive.

There is another observation on this head which is attested by the photograph published herewith. In 1895 I observed curves in plan concave to exterior in the eastern pediment of the Temple of Neptune at Pæstum, and they were photographed in 1895, as attested by Fig. 10. This photograph shows the concave curve in the line of abaci as well as in the cornice. I have never previously published these facts, for lack of time and opportunity, but I was moved by the observation at Cori to make it known to Professor Giovannoni and to send him a photograph. This observation has been laid before the Roman Society by Professor Giovannoni at their session of November 6, 1906, and the President of the Society has been kind enough to write me a congratulatory letter on this subject. It appears to me of high importance that the curve in plan at Pæstum concave to exterior should be carefully examined by experts on the site. Whatever the result at Pæstum might be, the curves at Cori still remain the first conclusively demonstrated constructive curves in plan, concave to exterior, which have ever been found in the construction of a classic monument.

This is the proper point at which to close this paper, for it is not my purpose to explain these concave curves. As long as it appears certain that the facts now known are sufficient to compel new explanations, it seems hardly worth while to figure as a theorizer. It is mainly my wish to show that previous explanations of the classic curves are insufficient to cover the facts now known. I may, however, add that Professor Giovannoni's announcement of the curves at Cori was made to the Roman Society of Architects in a report of a favorable nature regarding my own observations of mediæval

FIG. 10. CURVES IN PLAN, CONCAVE TO EXTERIOR, EAST FRONT OF THE TEMPLE OF NEPTUNE (SO-CALLED) AT PAESTUM.
Photograph of the Brooklyn Museum Survey of 1895.

asymmetries and deflections. Therefore, I may add also that the closest mediæval analogy to the façade at Cori is that offered by the lower façade of St. Mark's at Venice, which curves concave to exterior from the foundations up, with a deflection of ten inches at the foundations (Fig. 11).

It appears improbable that the façade of St. Mark's was curved expressly for effects of concavity in the upper line.[9] It is rather probable that the entire surface of the façade was considered. As regards line effects, they would, below the level of the eye, produce the optical effect of rising curves in vertical planes. Above the level of the eye they would produce the optical effect of descending curves in vertical planes. These line effects are optically contradictory, and therefore optically illusive. They must therefore give to the façade an effect of "life" or of optical mystery and vibration.

As regards views slanting along the façade of St. Mark's from left to right, or vice versa, the perspective effect is enlarged very considerably in the way of magnitude, if the terminal upright lines, rather than the upper horizontal lines, be considered. But here again it appears more likely that an effect of optical mystery and vibration rather than a direct increase of size in perspective was considered. It may be that the varied effects of light and shadow which are involved in a curved surface were the dominant considerations.

As regards the façade of St. Mark's, it should be remembered that only the lower façade is in question, and not the upper façade, which sets back of a wide platform, bounded by the cornice of the lower façade. Although this cornice has not been leveled or plumbed, it appears to rise from the extremities toward the center, so as to correct the effect of concavity at the roof line. In the upper façade the pinnacles are arranged in descending heights from the center towards the extremities.

In simple language, and aside from optical explanations, the façade of St. Mark's, in my opinion, gains vastly in artistic charm by its delicately and imperceptibly curvilinear surface, as well as by its subtle variations in the dimensions of the arcades. If mediæval curves be admitted to have been constructed at all, it must be conceded that the lively effect of the curved line or surface was held to be superior to the rigidity and greater formalism of the straight or plane surface, and that no other universal explanation can be offered. Whether or no this lively effect is physiologically due to optical mystery, which is again due to an optical vibration between the contradictory optical effects which must always be found in delicately distorted architectural surfaces or lines, or whether it is due to varied effects of shadow, is hardly worth debating. It may be that both explanations have to be considered. I offer the suggestion for what it is worth, with the remark that the concave curve in plan at Cori demands some kind of explanation.

If mediæval analogies be excluded, it is still evident that some explanation similar to those which have just been offered for them must now be sought for such ancient curves as are found at Cori. This involves farther reference to the concave curves in the Parthenon, if for no other reason than the one that other experts than Hoffer have already been inclined to admit their constructive existence. Thus Reber,[10] a German authority of high standing, considers the concave curves of the Parthenon to be constructive. His explanation is significant for the fact that the optical effect, in front view, is that of a descending curve in a vertical plane, which equals the amount of the curve in plan at the angle of 45 degrees, which decreases in amount from farther points of view, and which increases in amount on nearer approach. Reber holds that the concave curve was intended to contradict and decrease the excessive curve in elevation due to the combination of the optical perspective effect in elevation, on close approach,

[9] And especially so for the reason mentioned later in text that the cornice line appears to the eye to be built with slight obliquities rising from each end toward the centre, so as to correct the effect of concavity.

[10] Kunstgeschicte des Alterthums, p. 207.

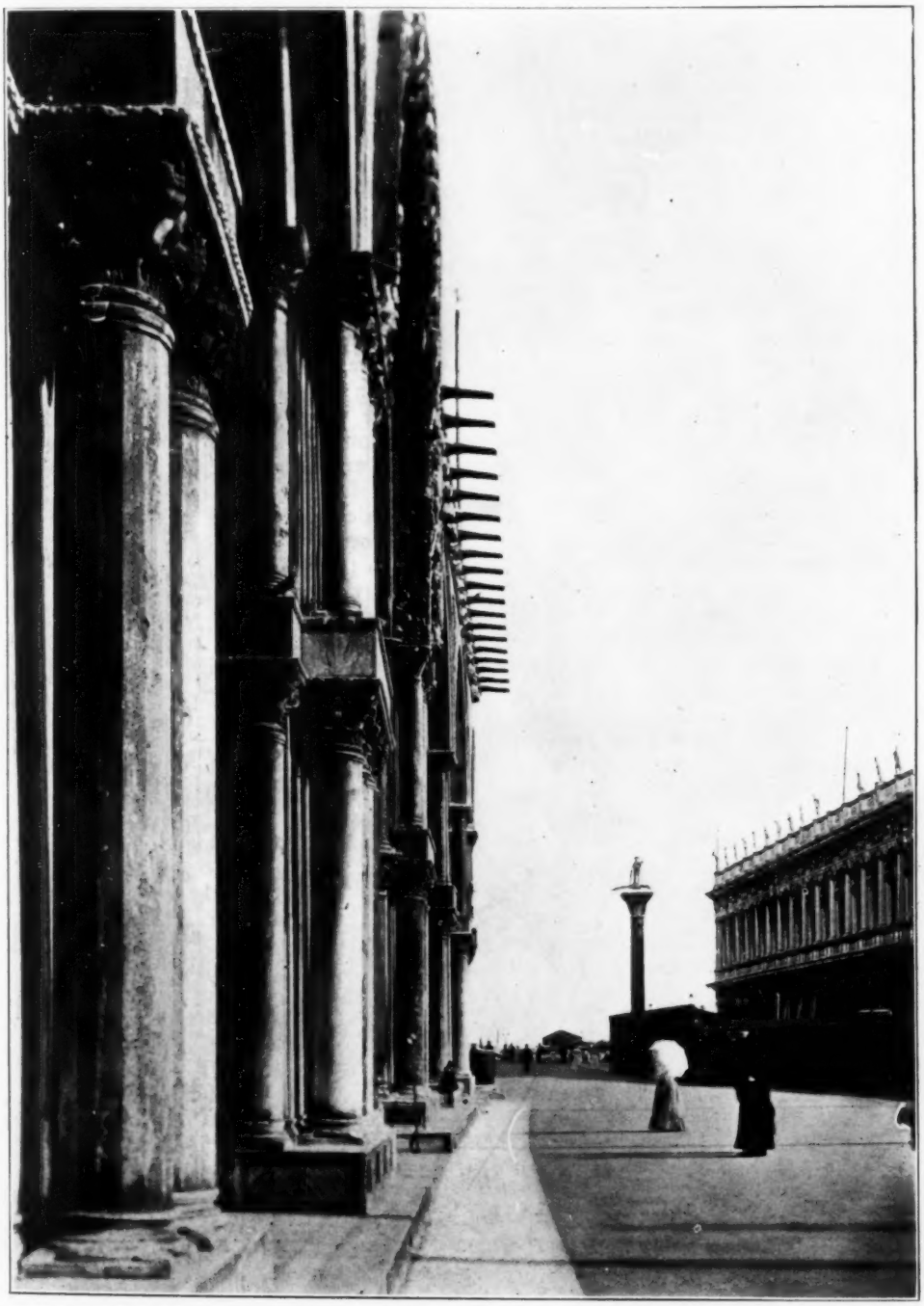


FIG. 11. CURVE IN PLAN, CONCAVE TO EXTERIOR, FAÇADE OF ST. MARK'S AT VENICE.
The deflection, of ten inches, is best seen on the outer line of the paving slabs in front of the church. Photograph of the Brooklyn Museum Survey of 1905.

with the constructive curve in elevation. The interesting feature of this explanation (although it cannot be applied to Cori) is that it realizes the two effects as being contradictory. Hauck quotes the explanation of Reber with tentative approval[11] as an explanation, but expressly affirming the principle that the effects of a rising curve in elevation and of a concave curve in plan are contradictory, and that the optical effect of the concave curve is that of a descending curve in a vertical plane. It is, of course, understood, as Hauck points out, that the contradictory effect is insignificant from distant points and then almost disappears.[12] It is also understood, whereas the rising curve in elevation has its greatest relative effect from a distance, that the optical perspective curve is far the greater on close approach, so much so that on close approach the constructed curve in elevation is not an important addition to its amount. Neither Reber nor Hauck have considered the possibility that the concave curve might have been considered desirable for its effects from the slanting side view, and Hoffer is at a loss for any explanation.

Although the constructive facts in the Parthenon may be held to be doubtful, the above explanations are of value as showing the difficulties which have hitherto surrounded the explanations of concave curves in plan, and also as showing that the effects of concave curves in plan above the level of the eye are recognized by optical experts as being those of descending curves in elevation for the front view.

The constructive facts at Pæstum do not appear to be open to suspicion, and here again there are also rising curves in elevation at each end of the temple.

If either the Temple of Neptune concave curves or the Parthenon concave curves are admitted to be constructive, it must also be admitted that contradictory effects exist for certain points of view, and it remains to be debated whether the side effect was not the one which was considered for the concave curve.

[11] pp. 100, 144, Op. cit.

[12] It would disappear entirely when the eye is on the level of the concave curve. Here the concave curve appears as a straight line.

For the Temple of Cori the question is not complicated by the existence of curves with contradictory effects, but it still remains to be debated whether the side effect was not considered as much as the front view. The Temple of Cori stands on a high elevation, and the lower position of the approaching spectator would, on near approach, much increase the optically descending effect toward the center of the curve. For such points of view it could only be presumed that the curve was considered more agreeable than the straight line, without reference to the question whether it were a rising or a descending curve. For side view the effects would be optically contradictory as regards perspective, an effect of increase if the vertical terminal lines be considered, and an effect of decrease if the upper horizontal lines be considered.

It is a natural result of our interest in the surviving ancient monuments that we overlook their actually very small number and the enormous number of those which have utterly disappeared. The discovery at Cori makes it probable that curves were employed in ancient art to a much greater extent and in much greater variety than has hitherto been supposed.

In a paper which I published in the Journal of the Archæological Institute of America, Vol. VI., No. 2, New Series (1902), "Architectural Refinements in Italian Churches," I discussed the optical effects of the cloister curves, convex to the center of the court, at Verona and Bologna. I pointed out that the line effects were contradictory above and below the level of the eye inside the corridors, and that they were again contradictory, but in the reverse sense, as observed from the court. From this I argued that the curve must have been preferred for its own sake and independent of any definite particular perspective effect. It has since occurred to me that an effect of vibration or of optical mystery in such curved lines or surfaces must result from the shifting of the eye to different lines or planes of sight or from the inclusion at points more distant from the eye of such contradictory effects within the limits of

fixed vision in a single direction. In churches like S. Apollinare Nuovo, at Ravenna, which have true parallel curves in plan in the alignment of columns, continuing in the walls of the clerestory, it is evident that the optical effects must be contradictory on the two sides of the nave, because the columns and wall surfaces are concave to the nave on one side and convex on the other.

In the Pisa Cathedral, moreover, where the gallery parapets are built in parallel curves in plan (which continue in the walls above), the same parapets also have constructive rising bends in elevation (Architectural Record, VI., 4).

Thus, from the pavement below, the curve in plan increases the effect of the bend in elevation on the south side, where it is convex to the nave, and it decreases it on the north side, where it is concave to the nave. (For the north side of the nave, the facts are analogous to those in the Temple of Neptune at Pæstum, and in the Parthenon, where contradictory effects are found in the cornice.) It may also be pointed out that, wholly aside from curves, it has always been contended by the writer that effects of optical mystery were studied at Pisa. The explanation is offered for what it is worth, and any others would be equally satisfactory to the writer which cover all the constructive facts.

Finally, as regards relationship in feeling, if not in continuity of historic practice, as between Antiquity and the Byzantine Romanesque monuments of Italy, the authority of Jacob Burckhardt may be cited. Ernst Foerster, in his Guide-Book for Italy, was apparently the first to announce intentional irregularities of line in the Pisa Cathedral. He held them to be "die unbeholfensten Aeusserungen des Romanischen Kunstgeistes." Jacob Burckhardt's foot-note to the Leaning Tower in his "Cicerone" in the first and second editions (this foot-note was subsequently removed from the text) quotes Foerster's idea as follows:

"For the history of art, Foerster's opinion about the relation of the Leaning Tower to the irregularities of measurement, oblique and bent lines, irregular intervals, etc., would be much more important [than his opinion about the Tower itself]. In all these things he sees a dislike of mathematical regularity and of exact symmetry. These are said to be the clumsy expression of Romanesque endeavor. (Die unbeholfensten Aeusserungen Romantischer Bestrebungen.) *Since we must unconditionally admit something of the kind in Greek temples, this view has something very attractive.* I believe, however, that the given phenomena must be otherwise explained, and, namely, not by want of dexterity—which could not be suggested for the noble Pisan buildings—but by an indifference to mathematical accuracy, which was peculiar to the earlier Middle Age."

Burckhardt then proceeds to give examples of this indifference (which certainly also existed). The foot-note just quoted inspired me to make a personal call on Jacob Burckhardt at Basel in 1870. I showed him the measurements and drawings which I had just brought from Pisa. He advised immediate publication, and professed his previous ignorance of the facts thus brought to his notice. Thus my own contact with Burckhardt shows that he was not familiar with the constructive facts at Pisa, whereas to him belongs the original suggestion that if the constructive facts exist they would be analogous in feeling to the deflections and asymmetries of Greek temples. To Foerster, on the other hand, belongs the original suggestion that obliquities and bends were intentionally constructed at Pisa. He can hardly, however, have noted the true and delicate curves which are also found in the cathedral, for these certainly can not be called clumsy.

As a final suggestion for façades like those of St. Mark's and Cori, it appears that the varying effects of light and shadow may have been the important consideration. Since these varying effects of light and shadow were notoriously studied with the greatest care in the profiles of classic architecture, why may they not have been considered for the surface of the façade at Cori? The same explanation suffices for the concave curves of Pæstum and of the Parthenon.

William H. Goodyear.

THE LADY CHAPEL—ST. PATRICK'S CATHEDRAL, NEW YORK.
The exterior from the east side of Madison Avenue.
(Photo by A. Patzig.) Charles T. Mathews, Architect.

The New Lady Chapel at St. Patrick's Cathedral, New York

It was a practice in England during the Middle Ages to dedicate to the Virgin Mary that chapel in the cathedral which was situated in the middle of the apse directly back of the high altar. In France also there was the same custom, though it was not so common, and in Italy, where Gothic traditions were never deeply rooted, the practice was still less usual. It was due to its dedication that this particular chapel came to be known as the Chapel of Our Lady, a term which was finally contracted into the simpler form, Lady Chapel, which is still in use throughout England.

It is also an ancient custom to reserve the Host or Blessed Sacrament in the tabernacle on the altar of the Lady Chapel, except at such times when for various reasons it may be removed to some other altar in the church, always, however, to be returned to its permanent shrine. It was owing perhaps to both its dedication and its use that the Lady Chapel was generally treated by the Gothic builders with an architecture more delicate and ornamental than that employed throughout the cathedral. It seemed to become in some cases a great reliquary upon which all the arts of the architect, the sculptor, the metal worker and the painter on glass were lavished.

When the Cathedral of St. Patrick was built in New York City this important feature of the building, the Lady Chapel, was omitted. The cathedral terminated abruptly behind the high altar, and a chapel was fitted up at the termination of the north side aisle which was used temporarily as a Lady Chapel. It was not until six years ago, in 1901, that it was decided that the east end of the cathedral should be reconstructed and properly terminated by a chapel which was to be known as the Lady Chapel.

A competition was therefore held to which fifteen architects were invited. Representatives from England and France, as well as native architects, were asked to submit designs for this remodelling of the eastern end of the cathedral, so that the event had, as it was quite proper that it should have, an international interest, New York being one of the most important sees of the Roman church not only in America, but in the whole world.

It was arranged that the decision as to the successful competitor should be made in this rather original manner: Prof. William R. Ware, of the School of Architecture of Columbia University, as architectural expert, was to select the design which to his mind best solved the problem architecturally. Then the Archbishop of New York, at that time the late Archbishop Corrigan, was to select the one that seemed to him the most satisfactory from the ecclesiastical point of view, and lastly the donors were to select the one which personally pleased them most. The final award was then to be made from the designs selected by these three parties.

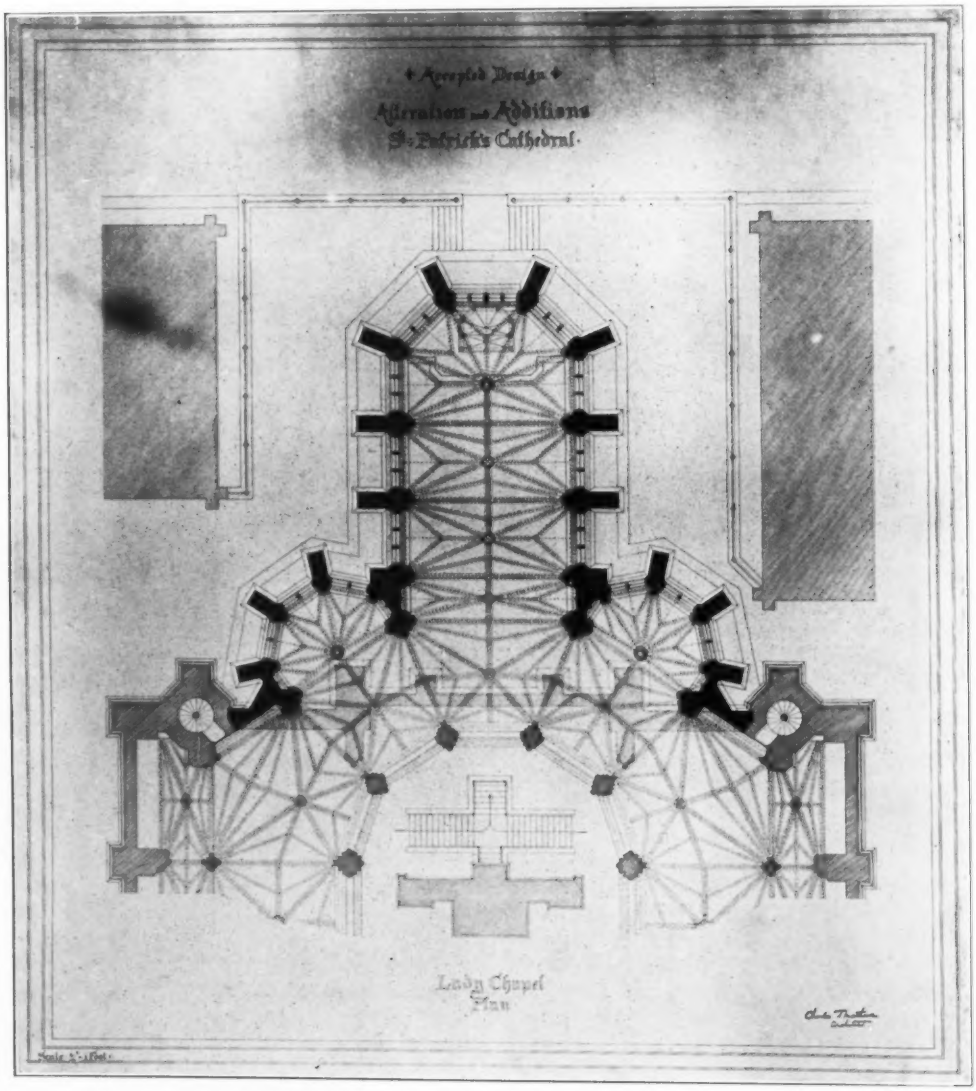
The drawings, of course, were unsigned, so that their authors were unknown to the judges, who did not obtain this information until the final decision.

It happened, to the great satisfaction of all concerned, that the three judges each recommended the same design for the final award. This therefore made further selection unnecessary, and the architect, Mr. Charles T. Mathews, who was the author of the design which had won the favor and commendation of each of the three judges, received the commission for the work.

Of the designs submitted by the foreign competitors, one exhibited an amusing disregard for existing conditions which were of course fully set forth in the programme. The author of this particular set of drawings, disregarding entirely the city's rights to Madison Avenue, continued his building across this thoroughfare, terminating it in the court

of the Villard houses on the other side of the way. This gentleman's muse was evidently unfamiliar either with municipal rights or the prices obtainable in the New York real estate market. In correspondence with him in relation to this disregard of the conditions, he merely replied that the street might be changed. A small matter, surely, where the aspect of a cathedral was concerned.

There is in every architectural problem a fundamental question, the solution of which is the key to the whole problem. What it is may not be known to the writers of the programme, nor yet to the competitors. It is sometimes not even known to the man who has successfully solved it. It appears, generally, at the judgment when all the designs are brought together. One sees



THE LADY CHAPEL—ST. PATRICK'S CATHEDRAL, NEW YORK—PLAN.
Showing the new construction in black. Charles T. Mathews, Architect.
(Photo by A. Patzig.)

THE LADY CHAPEL—ST. PATRICK'S CATHEDRAL, NEW YORK.
View from the ambulatory, looking into the chapel.
(Photo by A. Patzig.) Charles T. Mathews, Architect.

then the eminent and evident question, with its quite as clearly defined answer, upon which the whole solution depends.

In this problem of the Lady Chapel it was not so much the chapel itself which was the problem as the treatment of the rear wall of the cathedral, which

gether with the façade of the old Academy of Design which stood at the corner of Twenty-third street and Fourth avenue, in the construction of a church uptown dedicated to Our Lady of Lourdes, to which an article was devoted in the April issue of the Architectural Record.

THE LADY CHAPEL—ST. PATRICK'S CATHEDRAL, NEW YORK— THE CRYPT.
Located directly under the altar of the chapel and to be occupied by the tombs of the donors
(Photo by A. Patzig.) Charles T. Mathews, Architect.

the programme stated might be remodeled, or in other words, the joining of the chapel to the cathedral.

In the successful design the rear wall was removed, and now it may be interesting to know, has been utilized, to-

The rear wall, which abruptly terminated the side aisles, having been removed, it was then possible to continue the side aisles in an ambulatory around back of the high altar. The Lady Chapel with its two small semi-octagonal flank-

ing chapels was then placed at the rear of the ambulatory, through which it is reached from the church.

This solution decreased the available depth for the chapel, but on the other hand, and what was a greater gain, the cathedral was lengthened and the vista

pers who wish to assist at these functions. Therefore, although the ambulatory decreases its depth, it in no way interferes with the practical seating capacity of the chapel.

The problem since the writing of the programme for the competition has be-

INTERIOR ST. PATRICK'S CATHEDRAL, NEW YORK.
Showing the opening up of the vista beyond the high altar.
(Photo by A. Patzig.) Charles T. Mathews, Architect.

opened up behind the high altar, so that now the cathedral seems at least half again as long as formerly. The floor space devoted to the ambulatory is by no means wasted, for during services in the chapel it is available for worship-

come more complicated by the addition of various features. First the design was changed in order to provide for a sacristy underneath the chapel, with a crypt for the tombs of the donors immediately below the altar. Then by ex-

cavating for two rooms, dependencies of the sacristy, one on either side of the chapel, underneath the terrace, with a floor level a few feet lower than the sacristy; then by excavating still another story down under the chapel in order to provide a sub-cellar; and finally, by the construction of a boiler room placed beneath the terrace on the north side of the chapel.

The entrance to the sacristy is down a stairway directly behind the high altar, from which it is closed off by a bronze grille bearing in high relief the coat of arms of the late Pope Leo XIII., during whose pontificate the greater part of the chapel was constructed.

This placing of the sacristy in the basement is a modern innovation, the ancient custom being to locate the sacristy in an addition at the side of the church, or in a separate building connected with it by a covered passage, and this is the plan ultimately to be carried out at the cathedral.

The basement sacristy is, however, by no means illogical or inconsistent, even where economy does not force upon the designer, as it did here, the condition of keeping the sacristy within the walls of the cathedral. Its position is central, and its entrance is screened from view by the reredos of the high altar.

The lighting of the underground sacristy presented a problem which was solved in an ingenious manner. Gothic churches of the thirteenth century do not have basement windows; they rise in a wall of solid masonry, which produces a feeling of strength and stability. If this base is pierced by windows this impression of strength is to some extent lost and the character of the building changed.

To overcome this difficulty areas were cut between the buttresses in the large base or stylobate from which the chapel rises, this base being so high that the gratings over the areas are not visible from the street or the terrace. The sacristy windows, opening into these areas, are of opaque leaded glass, so in the interior one does not in the least have the impression of being in a room which is more than half underground.

The construction of the stairway to the sacristy necessitated a delicate piece of engineering which was finally successfully achieved, though not without considerable anxiety to every one involved. The stairway passes between the foundations of the two rear piers of the cathedral, which support the clerestory walls of the choir. These were built on the solid rock, and the construction of the stairway necessitated the removal of the rock between these piers. Blasting between these foundations was a very delicate operation, during which the slightest accident might have wrecked the entire cathedral. The work was successfully carried through, however, leaving the foundations in better condition than they were before.

The style employed by Mr. Mathews for the architecture of the chapel is the Gothic of France in the thirteenth century, though as we get towards the top of the structure some of the carving, particularly that on the pinnacles of the buttresses, has the character of the more ornate work of the early fourteenth century, giving the impression of a building whose construction had extended from one century into the other. The aim has been to make the structure as nearly as possible archeologically correct, and the greatest care has been taken with all the details, in order to bring about this result. The profiles of the moldings have been very carefully studied, especially those arch and gable moldings which appear in elongated vertical sections on the sides of the buttresses. This very characteristic feature is usually avoided in modern work, it being easier and cheaper either to continue the moldings down to the sill or to terminate them on a horizontal band at the spring of the arch.

The modeling of the grotesques and foliage were done under the personal supervision of the architect, and in some cases they are the work of his own hand. The gargoyles are not as fantastic as those which were originally designed for the purpose, having been toned down in deference to the wishes of some of the authorities who did not realize that the Gothic builders carved these ugly monsters to represent the evil spirits who

were striving to fly away from the sacred edifice.

As compared with the cathedral, the chapel is more refined in scale. The moldings are sharper, the carvings have more sparkle and the architecture, as a whole, is more ornate and elaborate. It is a rich and delicate pendant to the cathedral rather than a glorious crown, as is suggested by the chevet of the French cathedrals.

An original feature in the treatment of the exterior is the small octagonal spire, decorated with open tracery, which is placed over each of the flanking chapels. These are the means of hiding in a very clever manner the awkward silhouette of the main roof. The roof of the ambulatory is lower than the roof of the chapel, being a continuation of the roof of the side aisle, consequently we have in silhouette: first, the high choir wall, then a drop down for the roof of the ambulatory, then a rise for the roof of the chapel. The reason, of course, for making the roof of the ambulatory low is to get the full amount of light into the choir. If the ridge of the chapel roof were carried back to the choir wall it would be impossible to bring the rear choir window down to the same level as the others. In most French churches this unpleasant line is rarely seen, on account of the maze of flying buttresses which loses the outline of the roof, but at St. Patrick's, unfortunately, on account of the vaults being in plaster and not in stone, there are no flying buttresses, and it has been necessary to resort to this device, which is both ingenious and effective.

With the exception of the large bronze statue of the Virgin, which is to be placed at the end of the ridge of the roof, the exterior of the chapel is now practically complete, though, owing to its position between the archi-episcopal residence and the rector's house, it is impossible to obtain a comprehensive view of it. The removal of these two buildings would be a distinct gain not only to the chapel but to the cathedral itself.

The stone used in the construction of the cathedral is dolomite, but for the Lady Chapel it was found impossible to obtain the same stone, as the original quarry was in no condition to yield large blocks. It was therefore decided to employ an entirely different sort of stone, and a very fine quality of Vermont marble was selected for the purpose, which weathers to warmer tones than the cold greys of the dolomite. The roof and the flêche, which are of copper, together with the bronze figure of the Virgin, will, in a short time, take on patina, which will give a touch of color to the roof, lightening up this feature, which now, perhaps, seems a bit dark and heavy.

In the interior much remains to be done before it may be said to be complete. Everything in the interior is stone, with the unfortunate exception, as in the body of the church, of the vaults, which in this case are made in plaster on expanded metal. All the thrusts, however, for a stone vaulted ceiling have been computed and the buttresses are built sufficiently strong to withstand them. It is to be hoped that before many years means may be provided for giving to these buttresses the work for which they were designed and constructed.

The pavement of the chapel is of polished marble, inlaid in a gothic pattern, yellow, grey, green and white being the colors employed. In the middle of the pavement are inlaid the arms of Leo XIII. in bronze relief.

So far, the pavement is the only color to relieve the whiteness of the interior, with the exception of the unpleasant bluish green glass which has been temporarily put in the windows until the permanent glass is placed.

It is the intention to have the finished windows up before any other work is done on the interior, which is a very sensible method of procedure, for the windows contribute more than anything else to the color of the interior. Their tone should therefore be established in order that the other work may be made to harmonize with the background and atmosphere which they create. It is a hopeless task to try to design windows for an interior, the color scheme of which is already established. Everything is liable to be changed in the new light which they produce.

The type of window to be employed

is the medallion window, of which there are such fine examples at the Cathedral of Chartres. Those tapestries of jeweled splendor in which one at first sees only a geometrical pattern, but which on closer inspection prove to be numerous small figure compositions, divided one from another by the geometrical pattern that frames them.

There being fifteen windows in the chapel, including those of the small flanking chapels, the fifteen Mysteries have been chosen as the subjects which they are to illustrate. The large medallion at the top of each window is to set forth the Mystery itself, while the lower part is to be made up of compositions representing the prophecies which foretold, or the types and symbols of the particular Mystery in the medallion above.

It is cause for rejoicing that we are to be spared in this chapel at least the carefully painted colossal figure compositions in Munich glass which are used in the windows of the cathedral itself and which in no way suggest the beautiful jewel-like glass with which the Gothic builders filled the windows of their churches.

An elaborate bronze baldacchino and screen are to form the climax of the interior scheme. This is to be made a very brilliant feature by gilding all the decorated surfaces, which will reflect the light at all angles.

As has already been mentioned, one of the greatest advantages of the new chapel, or in the solution of the problem which has now been realized, is the gain which comes to the interior of the cathedral in added length and increased interest at the end of the vista, which formerly terminated abruptly behind the high altar. Now one sees, back of the great reredos, a mysterious maze of arches and columns and vaults, continuing the perspective beyond until it is lost in the dimness of the interior, through which, at the end of the vista, glow the Mysteries of the Faith in flaming jewels of light.

A. H. Gumaer.

THE UNIVERSITY BUILDING.
Evanston, Ill. Geo. W. Maher, Architect.
Detail of caps at entrance, showing motif of ornament, the poppy.

A Plea for An Indigenous Art

A certain Eastern publication in an editorial of recent date comments upon what it terms evidences of an architectural unrest prevalent throughout the country, especially among the architects of the so-called middle west. It declares that those who have dared to criticize certain models of architecture as being unsuited to our present day conditions and therefore un-American to be pessimists, who failing to understand the leading publications of Europe must agree that this unrest, this movement for a new art, is there deep-rooted and momentarily gaining strength, interesting the most advanced and progressive minds, and all this in spite of the hindrance imposed by tradition. Thus do we see traditional Europe emerging from the great transition which followed the overthrow of the art of the middle ages. In this country there is every evidence

THE UNIVERSITY BUILDING.

Evanston, Ill. (Photo by Henry Fuermann.) Geo. W. Maher, Architect.

truth, stand in need of enlightenment and are recommended to turn their faces eastward and there behold the "designs of cultivated beauty each with the stamp of the best American civilization upon it." This discussion emanates from an article which appeared in one of our Western publications, entitled "The Western Spirit." The article was written under the firm conviction that a new era, particularly in architecture, was at hand, not only in America, but throughout the civilized world. Those who have of late observed any of the of extreme progress along modern lines, for here we are not hindered by precedent. True, our art is but rudimentary, though many-sided in its development, not always chiseled and perfect, nor yet idealistic, but withal expressive of the country's rapid growth, where utility is the keynote and the practical motif dominant. Fundamentally this could not be otherwise, since here is a new country where the problems of existence are being remodeled, where the people themselves breathe of an expression their own, where in time to come simplicity

will prevail in its purest form, and art will become individualistic, an exponent of the surrounding life, a symphony dealing with the grandeur of actual existence. In contrast to this is the art of precedent, dealing altogether with the past, and therefore fettered hand and foot in its execution. It has been suggested by some critics that business activity, commercialism, is the tap-root of the so-called unrest.

THE UNIVERSITY BUILDING—ENTRANCE TO OFFICES.
Evanston Ill. (Photo by Henry Fuermann.) Geo. W. Maher, Architect.

On reflection no one can agree with such a statement. Such a cause is not a vital issue at all in this vast phenomenon. This wondrous agitation is not bounded on the east by the Atlantic, nor by the Pacific on the west, but rather extends in its momentousness throughout the civilized world. A thoughtful, analytical revolution is upon the minds of men. Evidence of the greatest advancement in the annals of history is apparent. The human mind is struggling with the mighty past, seeking to properly classify and index for future reference its conclusions, its failures and successes. Under the influence of modern thought and scientific research, many changes are being made in the forms of religion, government, in literature and the arts, adapting them to the demands of the present age. Phases of understanding and action that half a century ago were considered revolutionary in principle are now accepted as most conservative and rational. We must not limit the confines of such a revolt against the letter of the past to so passing a fancy as commercialism. The commercialism alluded to is but a phase of this vast mental activity; a necessity, as it were, in this stage of the development of a comparatively uncultivated soil, where the resources for production are yet in their infancy. Rather let us seek for the cause of this agitation in the great law of the universe, the immutable law of evolution. This law becomes comprehensible only as we move from the past forward into a higher state of being in which man's

inner self becomes exalted, his intelligence enlarged, where individuality becomes preeminent, and girds itself for nobler deeds.

Inspired by pulsating life and nature tangible motifs appear, the products of knowledge gained through a right interpretation of truth. In striking contrast are inspirations based wholly upon the form of precedent. Such inspiration should enter but vaguely into present day themes and their influence should have little to do with the guidance of future efforts. An incentive thus inspired may even be a menace to posterity. If we constantly copy the architecture of past ages, to the jotting down of every proportion, every detail with no attempt to vitalize any portion of it from life's great inspiration, we dishonor the past by plagiarizing it and the work then produced must necessarily be meaningless as genuine works of art. It is not logical to argue that we should use the old forms as a child would in building his imaginative houses with set forms of blocks. How ludicrous to produce modern creations of art on this principle and then to designate such efforts as American.

It is logical to expect in nature a product indigenous to its soil and climate, likewise every age forms its own achievements from its ideals. So in art every succeeding age must produce its own standard of perfection viewing this problem from its own standpoint. The Greek inspired by principles, intellectual and ethical, to which religious fervor and mysticism were in a sense subordinate, gave expression to his ideals through the horizontal line, a distinctive principle of Grecian architecture. On the other hand, the Goth cradled in mysticism under the pathos of climatic conditions inspired by the lofty trees of the north reaching heavenward, gave expression to his aspirations in the perpendicular line, the dominant line in gothic architecture. These two great representatives of human effort labored through these contrasting methods to express their ideals of architectural beauty.

It has been the problem of all ages since the discovery of these contrasting methods, the basic of all construction,

RESIDENCE OF MR. JOHN FARSON.

Oak Park, Ill. Geo. W. Maher, Architect.

The American Honeysuckle was used as the flower motif in the design and decoration of this house.

(Photo by Henry Fuermann.)

how to rationally adapt these principles to the ever-changing periods and conditions. Many and various are the methods that have been employed by succeeding generations and well have they stamped their individuality upon respective styles. It seems, however, that in the latter part of the nineteenth century the struggle for originality has in a measure been abandoned and a return to the old exact forms is being encouraged, particularly those forms known as the classic. For example, in the use of a column, instead of endeavoring to individualize the base, the shaft and the cap, the method prevalent is to employ the identical classic base, fluted shaft, scroll and cap and the copy must be complete, whether it be Doric, Ionic or Corinthian. One would naturally assume from such evidences of imitation that architecture had reached a state of perfection not to be changed or altered by any succeeding age and that the Greeks and the Romans had said their last word pertaining to art development. On reflection, one is convinced that this position is absolutely erroneous. The Greeks themselves were of all peoples the most progressive. Witness for instance the rapid change from the rigid outline of the massive Doric style to the freedom, grace and buoyancy of the Corinthian. There is no greater evidence of versatility found in the history and progress of art. In view of this wonderful advancement may we not assume that if the old Greek could have beheld centuries later the lofty proportions of the noble gothic structures with their flying buttresses, vaulted roofs and towering spires, they would have congratulated the creators of this mysteriously beautiful architecture. Though absolutely removed from the realms of their classic ideals would they have failed to appreciate the efforts of a strong and self-reliant people, albeit semi-barbaric, who had thus given individual expression to aspirations all their own?

STABLE OF MR. JOHN FARSON.
Oak Park, Ill. (Photo by Henry Fuermann.) Geo. W. Maher, Architect.

It is contended by a certain few that specified examples of architecture erected in this country during the last decade are strongly American in style; notable among the buildings mentioned are the Boston Public Library, the Library of Columbia University, the Harvard Club, the University Club, the Pennsylvania Railroad Station, the Madison Square Presbyterian Church, and the Gorham Manufacturing Company's Building.

We would in no wise depreciate or pass judgment upon these noble edifices

in which the grandeur of the past is so illustriously brought before the eye. The materials employed are costly and beautiful, the proportions classical to a degree and the modeling so Greek or Roman that while viewing them one might easily imagine oneself to be in some ancient city of Europe. The truth in regard to the style of these respective buildings is manifest; they do not in the least represent an American art or civilization, but are pure and noble types for museum reference. It would be folly at this time to make a just comparison between the relative merits of the classic and a modern school of architecture. No one for a moment imagines the modern day creations yet rival in beauty these costly monuments, or that any effort yet put forth is wholly worthy to represent the architecture of America. However, the efforts evolving from heart and mind of the artist who is striving to depict his day and generation is of ultimate value to posterity. Time alone must be the arbitrator in this momentous discussion. Posterity will utter the final word either of approval or disapproval.

The illustrations accompanying this article are shown not as examples representative of the work produced in the middle west, but rather as illustrations of individual effort, since an indigenous art is not yet recognized in this country. These buildings are in the main designed on the motif rhythm theory. The fundamental principle being to receive the dominant inspiration from the patron, taking into strict account his needs, his temperament, and environment, influenced by local color and atmosphere in surrounding flora and nature. With these vital inspirations at hand, the design naturally crystallizes and motifs appear which being consistently utilized will make each object, whether it be of construction, furniture or decoration, related. The edifice then not only reflects the life of the occupant, but becomes an intelligible creation with character and originality combined. This theory when applied with an open mind is susceptible to the most far-reaching and beautiful results, infinitely beyond anything thus far attempted.

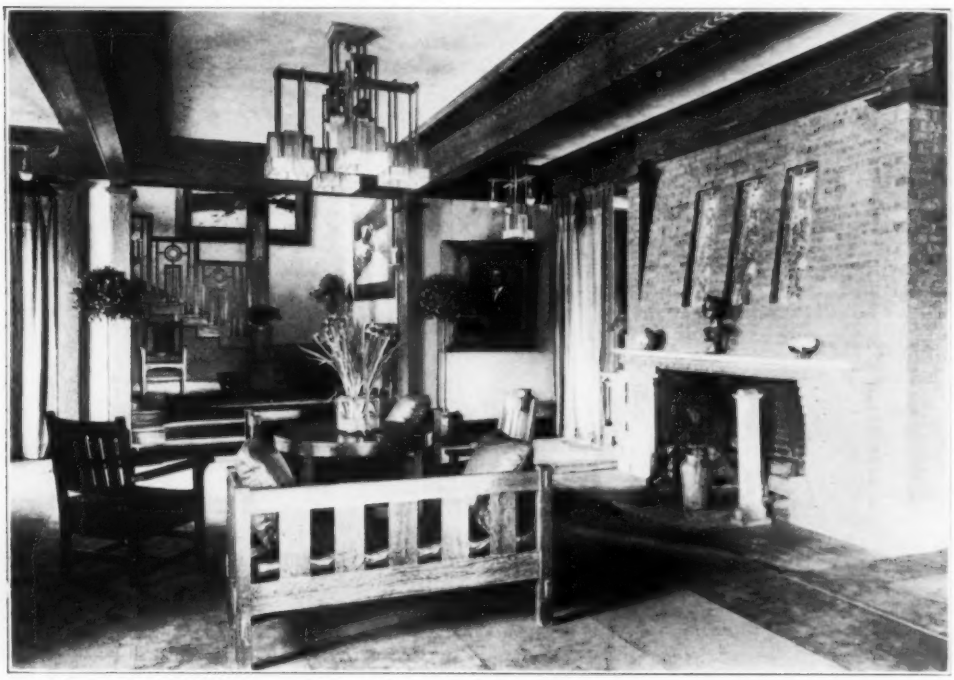
George W. Maher.

RESIDENCE OF MR. HARRY RUBENS.

Glencoe, Ill. (Photo by Henry Fuermann.) Geo. W. Maher, Architect.

What Is Indigenous Architecture?

The foregoing plea of Mr. Geo. Maher for an "indigenous" American architecture raises so many questions of fundamental interest that we do not like to let it pass entirely without comment. The most important question it raises concerns the intellectual attitude which the American architect should assume towards his own work. Should he consciously seek to make his buildings a translation more or less adapted to American conditions of the traditional European technical methods and architectural forms? Or should he consciously seek to break away from the traditional forms and design buildings which are, as Mr. Maher puts it, "indigenous"—the product of the American social and intellectual point of view and of the American physical facts? The necessity of making this choice may not weigh very heavily upon the majority of American architects; but consciously or not, the attitude which they adopt thereto determines to a very considerable extent the character, if not the value of their work. His intellectual environment forbids an American architect the privilege of designing in a wholly innocent manner, as did the architects in the greatest periods of architectural design. He is obliged to make a choice between the acceptance of the more or less traditional or the more or less revolutionary point of view, and even if the choice is made, as it usually is, for instinctive or accidental reasons, the man's work is thereafter profoundly influenced by the logic of the choice. The



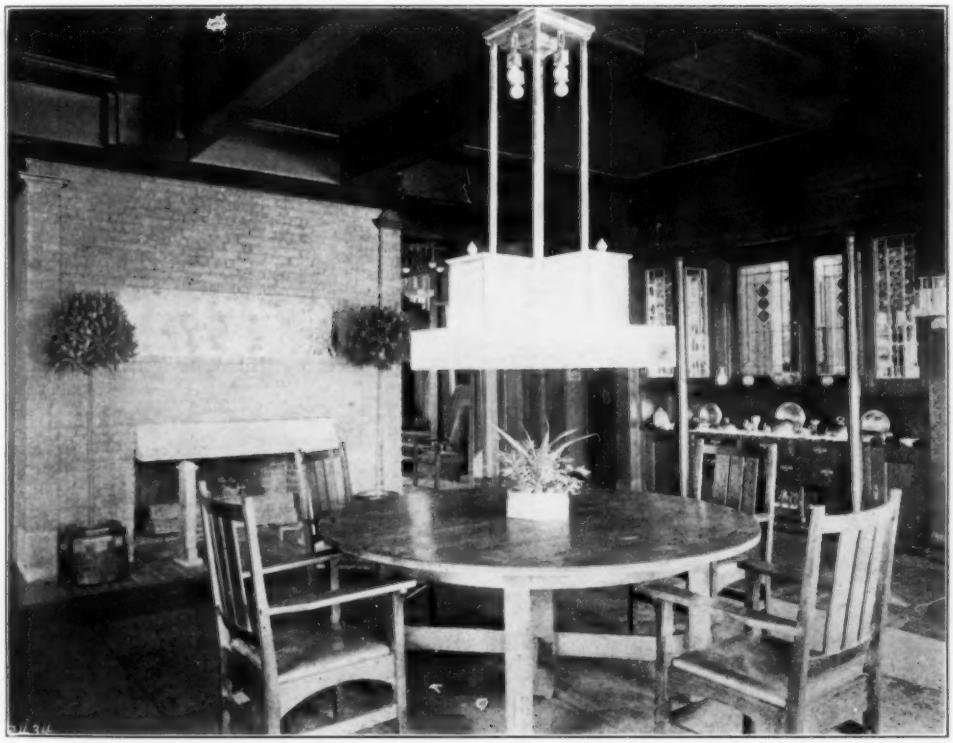
RESIDENCE OF MR. HARRY RUBENS—HALL.

Glencoe, Ill. Geo. W. Maher, Architect.

The motif flower in this house is the Hollyhock, which appears with other geometrical motifs in Ironwork, Piers, Roofs, Gas Fixtures, Art Glass, Stairs, Mantels, etc.
(Photo by Henry Fuermann.)

architect who accepts the traditions usually becomes bound by the traditions very much more, perhaps, than he intended, and the man who rejects the traditions is usually carried by the spirit of revolt much further than he should be. They take, that is, a decisive attitude towards a question which cannot in justice to the whole situation be answered in an entirely decisive manner; and American architecture will improve just in proportion as the American architect ceases to adopt, either on one side or the other, the position of an extremist. American architecture, that is, will improve just in proportion as the men who accept the traditions seek to modify them in every practicable manner in order to adapt them to local conditions; and it will also improve just in proportion as the men who seek an "indigenous" architecture hold to the traditional methods and forms, wherever they express a genuine American social and intellectual need.

The mistake, which Mr. Maher and others make, is that of drawing too sharp a contrast between the past and the present in architecture, or (if you please) between architecture in Europe and architecture in America. Intellectually and socially our own country has never been as independent either of Europe or of the past as Mr. Maher's argument implies. We occupy, it is true, a separate continent with certain special physical characteristics. It is also true that we seek to be an uncompromisingly democratic nation, and that in this respect also we seem to be sharply divided from Europe. But the mere physical division is unimportant, so long as our countrymen have not won their intellectual independence; and a century or more of political independence has not emancipated Amer-



RESIDENCE OF MR. HARRY RUBENS—DINING ROOM.
Glencoe, Ill. (Photo by Henry Fuermann.) Geo. W. Maher, Architect.

ican thought. During that whole century American intellectual and social habits have merely been an echo of European intellectual and social habits. Neither does a mere declaration of independence, such as Walt Whitman declared in poetry or such as Mr. Maher and others would declare in architecture—neither does a declaration of independence achieve the desired result merely by the force of words. Walt Whitman, in spite of the fact that he raised on high the banner of "indigenous" poetry, always remained in his own country an intellectual exotic. Just because he has had no precursors, he gathered no really valuable following. His poetry remains, not a song of the American democracy, but a song of himself. American intellectual independence can only be gradually achieved. It must be the result, not of the defiance of precedent, but of the slow accumulation of a new set of precedents. We need emancipation, not so much in respect of Europe, as in respect to the moral cowardice of our intellectual and social past. A man who appreciates the need of emancipation does ill to make it equivalent to the assertion of the American against the European point of view. American, of course anybody of local thought and art must be; but it must be American in a new sense. And the new America can only be slowly and cautiously constructed out of the materials afforded by the American past and present.

RESIDENCE OF MR. HARRY RUBENS—LIBRARY.
Glencoe, Ill. (Photo by Henry Fuermann.) Geo. W. Maher, Architect.

In a very real meaning of that word our country already has an "indigenous" architecture. It is not indigenous in Mr. Maher's eyes, because in many respects it is profoundly and tamely traditional, but its traditional characteristics are a genuine expression of the intellectual and

social point of view of the average well-to-do American. The American gets what he wants and what he can understand in architecture, as in literature and the drama. It is too bad that he does not want something different and better, but it is no use producing plays that are never heard, books that are not read or houses which their owners do not like. An architect of Mr. Maher's opinions may sometimes find a client who likes Mr. Maher's version of the "indigenous" house, but when Mr. Maher imagines that in such houses he is expressing the "needs, the temperament and the environment" of his client he is mistaken. What he is really expressing are his own needs and temperament, which he has succeeded in imposing on his client. The client, in case he had failed to meet Mr. Maher, would have had his needs and temperament just as well expressed in an ordinary Colonial house. It is because the majority of the most popular and best architects in the East sedulously conform to the needs and the temperaments of their clients that so much of our good domestic architecture is so bad. These clients usually wish their houses to be a combination between a baronial hall and a museum to hold the spoils of their financial and industrial conquests. They want the effect to be good in the traditional sense, but they also want it to be big and bold and stunning and redundant. The architect who designs this sort of thing is at least compromising his own technical and intellectual needs in order to supply those of his client. In the Middle West the state of mind which is too big and overflowing for anything but a baronial hall is not so frequent as it is in the East. The successful Western business man is usually satisfied with something simpler and more genuinely domestic, but it is not anything less traditional. If his own ideas exclusively are consulted, the result is Colonial, Elizabethan or Jacobean; if he consents to a house whose design seeks to be something other or more than traditional, that is only because he has come to place confidence in his architect. It is not to be expected that the prosperous American business man and his wife, for whom the ordinary dwelling is constructed, will have original or edifying ideas about his residence. His house will figure in his own mind as in the first place a convenient and healthy domicile; and in the second place as a structure which appeals to familiar associations. If such dwellings are to obtain distinction and originality, these qualities must derive from the ability of the architect at once to satisfy his client's practical needs and at

RESIDENCE OF MR. JAMES A. PATTEN—FRONT.
Evanston, Ill. (Photo by Henry Fuermann.) Geo. W. Maher, Architect.

the same time to impose his own technical standards and (perhaps) his own personal ideas. The improvement of American domestic architecture depends, that is, absolutely upon the increasing authority of the architect with his client—upon the ability of the architect to obtain in disputed cases his own way.

The ability of the architect to obtain his own way will in its turn depend upon the use he makes of the authority he has already obtained. If he uses his authority merely to spend as much of his clients' money as he can upon a gilded copy of a French château or an Italian palace, he will at the present time be doing comparatively little for the improvement of American domestic architecture. Time was when such copies, if rendered in a scholarly manner, were by way of being an advance; but now we have had enough of them. They express superseded standards. On the other hand, the architect who uses his authority merely to impose upon his client houses, which so far as possible violate precedent, and which are divorced wholly from the popular associations connected with domestic architecture—such an architect also is pursuing a course which in the long run will diminish the prestige of his professional brethren with their clients. American architecture must not stand still, but it cannot travel too fast. It cannot be wrenched away from its own immediate precedents in this violent fashion. It must advance from the good use of familiar forms to their better use, always keeping in touch with its own past, but always aimed at a better future. A domestic architecture of this kind would be really indigenous. It would be adapted to the prevalent American intellectual and aesthetic standards, whereas the attempt to popularize all at once revolutionary standards and forms could produce only exotic results. Such attempts certainly arouse one's intellectual sympathies. The independence and courage they exhibit deserve admiration; and in many instances specific buildings designed in this spirit call for unqualified approval. But this independence and courage are being misapplied. We can prepare in the present for a better future only by fulfilling the better promise of our past. A really edifying and fruitful tradition in American architecture cannot be founded by a cultivation of the spirit merely of revolt. At bottom it is a profoundly individualistic point of view, which vitiates Mr. Maher's plea for an "indigenous" architecture. Architecture always has been and always must be an essentially social expression, and the fact that the American nation is a democracy does not diminish but rather increases the social ties and responsibilities of the artist and the man of letters as well as of the politician.

The architect who uses his professional authority to the best advantage belongs, consequently, as we have intimated, to one of two classes. He will be a man who has thoroughly mastered the historical traditions and the proper technique of his art, but who is at the same time honestly and intelligently desirous of giving them a local expression. Or he may be, if you please, a man who resents the power of mere tradition in all American intellectual matters, but who understands that in his practice as an architect it is better for him to accept traditions and methods of which he does not wholly approve, rather than attempt to get on without their steadying influence. With men of the first tendency the emphasis will be placed upon the fulfillment of the tradition; and the modifications will be slipped in as it were by the way, just as the late Stanford White, for instance, steeped though he was in a specific architectural tradition, was often very original in his use of building materials and in his arrangement of French and Italian fabrics and furnishing. With men of the second tendency the emphasis will naturally be upon the free treatment of the traditional forms which they use. They will, indeed, accept these forms for the purpose of bestowing upon them, if possible, a new value, and with this purpose on the top of their minds, they will naturally try many experiments and take many risks, which their more conservative brothers would not consider worth the expense. Nevertheless each of these classes of architects would be contributing to the same ultimate result. They

would be familiarizing the more intelligent American public with architectural forms, different in some respects from those of Europe; and they would in this way be preparing a local architectural tradition which would be both sound and flexible enough to take advantage of every improvement in American æsthetic and social standards.

At the present time the great opportunity for an "indigenous" American architecture (in Mr. Maher's sense) is offered rather by business than domestic buildings. American industrial methods have really been revolutionary. American industrial organization is really a new thing under the sun. These unprecedented achievements in the organization of trade and industry have their appropriate expression, so far as building is concerned, in the huge factory and "skyscraper." Both the proportions and the structure of such buildings demand a wholly original treatment, and in the preparation of such a treatment the architect is hindered rather than aided by the classic precedents. When designing skyscrapers and factories, it would be far better in case the American architect could dispense entirely with his usual architectural stock in trade, but unfortunately such an abstraction is intellectually impossible. As well might one expect the mediæval ecclesiastics, who spoke, thought and wrote in Latin, to become the founders of vigorously vernacular literature. The American architect cannot for the present get away from his Latin and that is why he has made such a failure of the skyscraper; but his Latin is much less of an embarrassment to him in the design of domestic buildings. American social and domestic life is not revolutionary, like American business methods and industrial organization. It is a copy, modified, of course, by American conditions, of European domestic and social life; and the American architect, in seeking to give it more of a vernacular character, has found it difficult to find any support for his new language in new social needs or in new moral and intellectual ideas.

STABLE OF MR. JAMES A. PATTEN.
Evanston, Ill. (Photo by Henry Fuermann.) Geo. W. Maher, Architect.

When we say that American domestic and social life is a reflection of that of Europe, we do not mean, of course, that the reflection is faithful in every detail. The builders of "palatial" residences in and near New York have, of course, tried to copy in the most faithful spirit the social forms and diversions of the European "upper classes," and both the results of this attempt and its futility have been exposed recently with admirable lucidity by Mr. Henry James. There is unquestionably an incongruity between the pomp

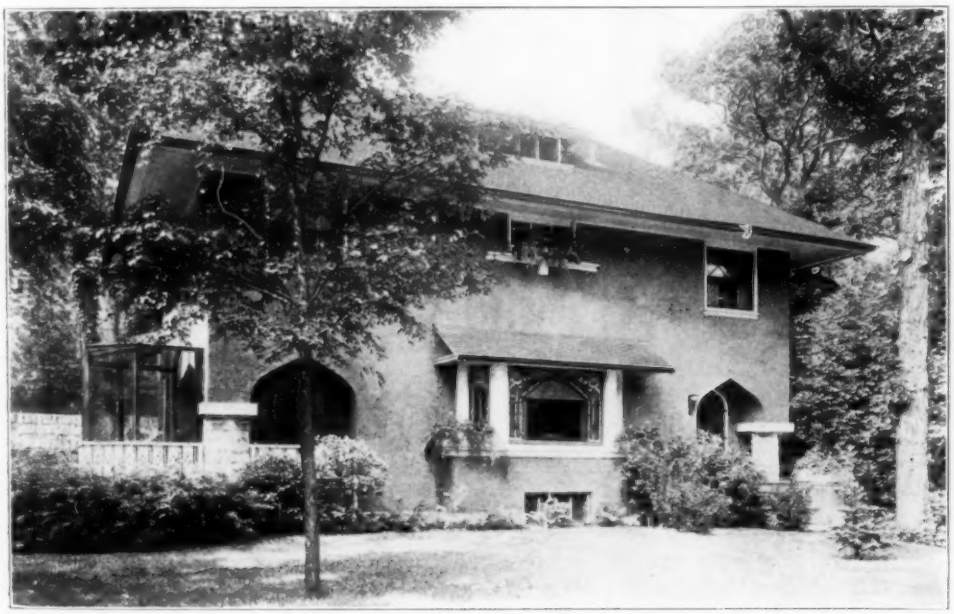
and circumstance of the architectural scenery with which these people surround their social lives and the realities of their positions and needs as simple American citizens. The one step which American society has taken in the direction of democracy is in the direction of the complete abolition of distinctions of class as such; and the result of such an abolition is to make the social pretensions of

RESIDENCE OF MR. JAMES A. PATTEN—DINING ROOM.
Evanston, Ill. (Photo by Henry Fuermann.) Geo. W. Maher, Architect.
Note the Thistle motif in all carving and ornament.

the best New York society wholly absurd. But while class distinctions have been abolished Americans have not in the least abolished or even mitigated a still deeper source of social distinction and misunderstanding—those founded on differences of wealth. The household of the average American business man is organized on precisely the same basis as the household of the average European "bourgeois"; and whatever "indigenous" qualities it may possess certainly do not appear upon the surface. In both cases the possession of a certain amount of money absolutely determines the lives of its possessors, and that is all there is to be said about it. The English merchant of 1750 liked the timid and discreet correctness of the Georgian residences, and the American business man of 1907 naturally likes very much the same sort of thing, because his social and his intellectual outlook is not essentially different.

The abolition of class distinctions in American society has, indeed, been supposed to have one consequence of some importance for the architect of domestic buildings. The European house was built for the member of a class, even when the class to which the man belonged occupied a socially inferior position, whereas the American house is built for an individual. Probably it is this idea

which Mr. Maher has in mind, when he proposes to adapt his designs to the "needs and temperament" of his clients, and surely it is an idea born of illusion and misunderstanding. The house must, indeed, be adapted to the "needs and the temperament" of the owner in the sense which has been explained above. It must, that is, be a house in which the owner can live conveniently, comfortably and without any sense of incongruity. But the notion that a man's "temperament," as distinct from his practical needs and



RESIDENCE OF MR. C. M. ROE.

Kenilworth, Ill. (Photo by Henry Fuermann.) Geo. W. Maher, Architect.

his intellectual standards, demands expression in American domestic architecture, is one which can hardly be taken seriously. The architect who sought to design "temperamental" houses would have the delicate decision to make as to whose "temperament" the house should express —that of the husband or of the wife; and if he selected the husband he would probably have some difficulty in explaining, say, to a refined and delicate wife his reasons for designing a house in the manner which would express the temperament of her somewhat aggressive husband. The only way in which a man's "temperament" can obtain legitimate expression in the original design of a building turns upon the amount of money which he will spend. Some men willingly appropriate all the money they can afford for the purpose of doing justice to the design of their architects. Other men, who could just as well afford to be liberal, regard the architect as a contractor who has agreed to supply them with so many rooms for so much money. Such a difference in temperament will be expressed in the appearance of a house, whether an architect seeks it or not; but beyond that the one way to obtain a "temperamental" quality in American domestic architecture will be to pass a law forcing every man to be his own architect.

What the design of American houses needs is not temperament, but style; and style is the characteristic which every intelligent architect should seek to give his buildings. Just what "style" in architecture may be is not easy to define, and we shall not in this connection seek

to define it, but at all events it is a characteristic which appeals to a number of people rather than to one. It appeals to the aesthetic common sense of men. It means something more than individuality, because there is nothing arbitrary or merely prankish about it; but it is entirely consistent with the utmost vivacity of feeling. It cannot be achieved save by a most thorough mastery of an architect's technical resources, but neither can it be achieved merely by such a mastery. The union of beauty with propriety which it implies can be obtained only by a touch of imagination. In its absence domestic architecture can have no permanent value and can make no permanent appeal. The house that is designed to suit the merely individual traits either of an architect or an owner will not in its interest outlast the life of the individual. The owner during his life will have every right to stamp on his house the characteristic marks of his own manner of life and taste; but the architect cannot and should not provide either for or against such effects of subsequent habitation. The architect must merely recognize that the taste and life of the owner may either confirm or impair the value of his work. In any event all that he can do is to give that work its maximum value by making it the completely formed product of all the conditions which have any right to be considered.

RESIDENCE OF MR. F. N. CORBIN.
Kenilworth, Ill. (Photo by Henry Fuermann.) Geo. W. Maher, Architect.

H. D. C.

Massachusetts Institute of Technology

Department of Architecture Course of Instruction

The Institute of Technology was the first school in this country to introduce a regular course in Architecture. The course was established in the year 1865, but instruction was not begun until 1866, and the first student was not graduated until 1873.

The curriculum has been planned recognizing that in a profession of as many aspects as that of Architecture, the true function of school training is primarily to inculcate high ideals, and to prepare the foundation upon which the student is to erect his superstructure of architectural capacity. The student's mind must be educated to reason and think clearly and logically. His sense of beauty must be trained and cultivated. His imagination stimulated, his point of view made flexible, and his skill in expression in the mediums of the profession cultivated. He must be made to see that architecture is essentially a fine art, and that its practice must be based on his possession of a broad general cultivation and a liberal training in design founded on the principles underlying sound construction. All this can only start him in the right way, but it is the essential training for the student who is to become an intelligent architect.

At the beginning the spirit of instruction was based on that of the Ecole des Beaux-Arts at Paris. The wisdom of this has been amply justified by the results obtained during past years, and by the present status of architectural education in this country. Since the beginning the general plan of instruction has been changed only by developing the older courses and by adding others to meet the new conditions arising in modern practice. The instruction is both general and special. The facilities of the school as regards instruction staff and equipment are such as to permit of individual instruction to the greatest extent.

To be entitled to the degree of the Institute, Bachelor of Science, the student must have completed all the prescribed studies and exercises of the four years' course, and also an original thesis design accompanied by an explanatory memoir. About half the second term of the fourth year is devoted to the preparation of this thesis.

The strong position which cultural subjects hold in the curriculum may be shown best by the subjects under this heading, in which the candidates for regular admission to the Institute must pass a satisfactory examination, and also the subjects of this element of general training as continued through the entire four years course.

Entrance examinations are held in elementary French and German. In English the test is, as far as possible, the candidate's ability to express himself in writing clearly and accurately, and of his power to distinguish, in a broad sense, literary values, the qualities which mark a work as literature. He is required to have some acquaintance with good literature, and the examination is intended as a proof rather of his power of intelligent appreciation than of his knowledge of special books. In History he must have a thorough acquaintance with the history of the Thirteen Colonies and of the United States up to the present time, together with an elementary knowledge of its government. Or, instead, the requirement covers the history of Greece and Rome to the fall of the Roman Empire in the West.

The applicant must also present satisfactory evidence of preparation in one of the following electives:

Additional French or German, Latin, Additional English, Additional History, Chemistry, Mechanical Drawing and Mechanic Arts, Biology.

The object of these elective requirements is to secure and recognize greater breadth of preparatory training.

During the first year French is a regular study, as well as rhetoric and English composition, and a half-year is given

to the history and government of the United States.

During the entire second year German is a regular study. English literature and composition are continued, and a half-year of European history is added.

All students who are candidates for the degree of the Institute (except college graduates) are required to complete a prescribed course of reading of a non-professional character during the summer vacations following the first and second school years. The purpose of these courses is to increase the acquaintance of the student with literature, history and general science; to develop in him a taste for such reading, and to impress him with the importance of general culture, not only as a source of individual enjoyment, but as a practical aid to professional men in their social and business relations.

The regular students in the third year are required to devote one hundred and twenty hours during the two terms to elective work in general studies, with entire freedom in choice of subjects from a carefully prepared list of options in economics, English, modern languages and history. Besides this, there are half-year courses in political economy and business law. The remaining subjects for entrance examination are physics, mathematics, algebra and plane and solid geometry.

The first year is mainly devoted to preparation in technical and cultural subjects so that the work of after years may proceed at the greatest strides. Professional work begins with free hand drawing, which is continued through the four years. Students study from the cast of the antique, from architectural detail and from life, with individual instruction. The drawing exercises are supplemented by lectures on art anatomy and memory drawing. In the graduate year decorative figure design takes the prominent position belonging to it when associated with architecture in its highest development, and is studied in its varied relation to painting and sculpture. Besides the large and well-equipped drawing-rooms of the Institute, the Museum of Fine Arts offers excellent opportunities for drawing from the cast, and regular exercises are held in its galleries.

The courses in free hand drawing are supplemented by others in water color, pen and pencil, composition and rendering and modelling. In water color, which lasts through one year, the purpose is to give a good knowledge of the use of brush and color, primarily with a view to architectural rendering. The instruction begins with study from still life in the studio. As the work progresses opportunity is given for out-of-door sketching, and during the summer vacations students are expected to make sketches to present for criticism when the next term opens.

In pen and pencil, which lasts through one year and a half, the purpose is to ensure facility in rendering architectural subjects in both these mediums. Individual instruction is given in one-hour periods, and each week the work of the previous one is criticized before the class.

Composition and rendering, which lasts through one year, is elective in the regular course, but a regular study in the graduate year.

Modelling lasts through one year, with the purpose of teaching the student the value of the third dimension, which he needs to recognize for the proper understanding of architectural detail. He is taught the manipulation of clay and its practical use as an aid in design.

Design and the history of ancient architecture are taken up simultaneously in the second year. The student begins with the study of classic work. It is the logical starting place because in the orders culminated all ancient architecture, and in the orders was the birth of the great styles that developed in later years. It is a study that involves all the fundamental principles of architecture and requires historical knowledge and accuracy. It gives the student a solid training in balance, proportion, light and shade, scale and color. In fact, the study of classic architecture will be of the greatest value to him when he takes up his actual professional work.

The student is made to study and analyze the elements of the best examples

MASSACHUSETTS INSTITUTE OF TECHNOLOGY, ARCHITECTURAL DEPARTMENT—THIRD AND FOURTH YEAR DRAWING ROOM.

of classic work in order to cultivate his taste and sense of proportion. At the same time the fundamental principles of architecture are inculcated, and the influences governing composition are explained and discussed. Lectures are given on the proportion and correct use of the Greek, Roman and Renaissance Orders, arcades, balustrades, windows and other architectural details. A thorough course in shades and shadows is given concurrently with that of the orders, and the student learns that by applying to his drawings the laws of the projections of shadow he indicates in a degree the third dimension, and at the very beginning is made to see the importance of light and shade as a factor in the composition of design.

To familiarize the student with these forms and the value of the third dimension, and to give him the best possible idea of scale, full size models of various orders have been prepared from which measured sketches and accurate drawings are made. Continued practice in drawing and academic rendering affords the training necessary for the hand and eye, and he is thus well started for the subsequent practice in original design, which continues with increasing importance each year until the student graduates.

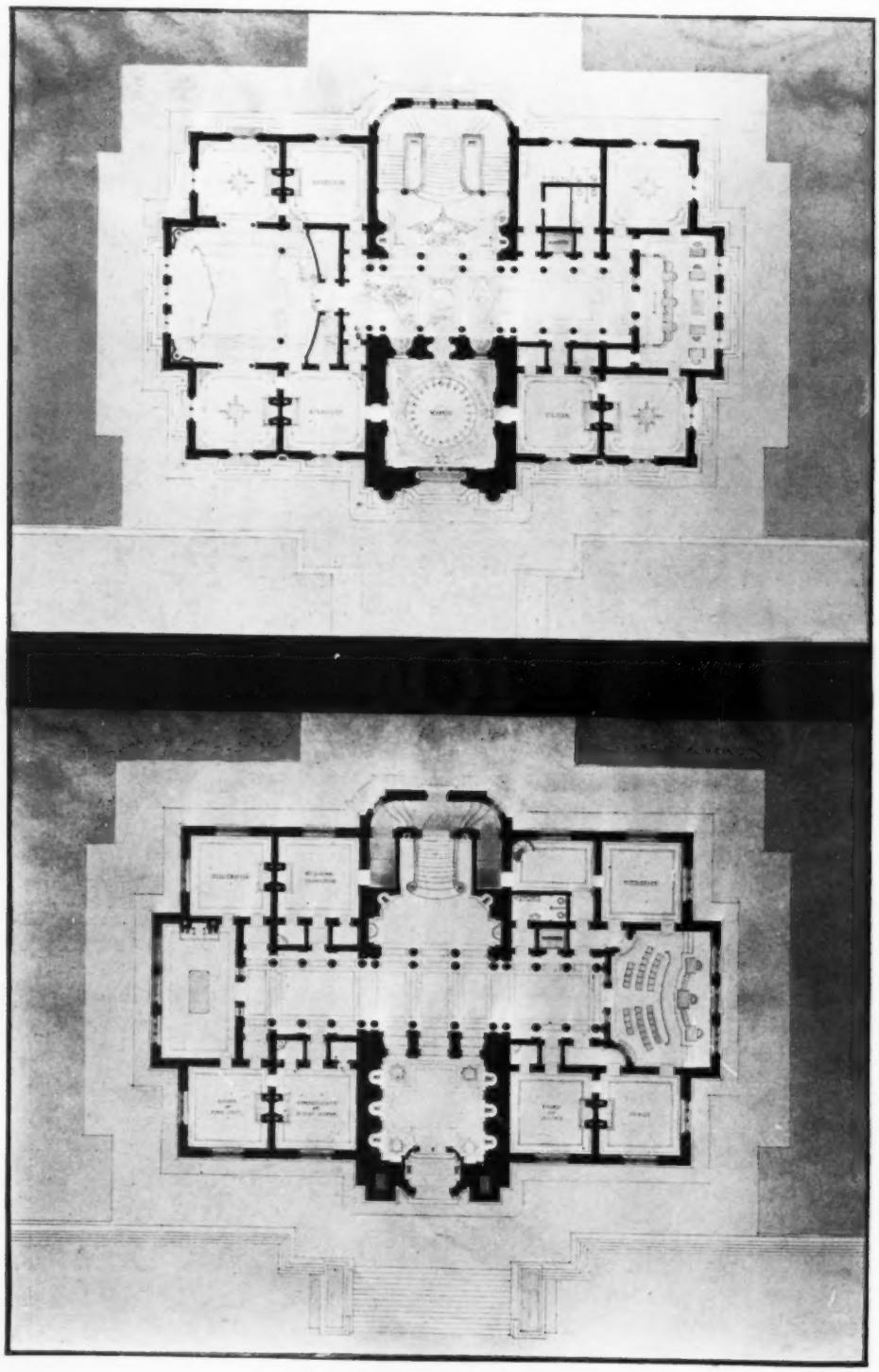
Lectures are given on the theory of design at frequent intervals. Its practice is in charge of instructors who are actively engaged in their profession. In fact, the main instruction force has always been made up of men either engaged at the time in architectural practice or who have had previous experience sufficient to know that Architecture should be taught as a living, progressive art. This fact, besides, has a great deal to do with the active sympathy and help which has always been extended to the Department by the Boston Society of Architects. The membership in the Society of so many of the instructors has tended to continue from the beginning these close relations, the value of which cannot be overstated.

The study of original design is by means of regular problems, and criticism of them before the classes. The problems assigned to each class vary from sketch problems to be designed and rendered in one day "en loge," to the one to be finished in a week, and the more difficult problems, for which an entire month or more is allowed.

In order to accustom the students to concentrate their minds upon the development of a single idea, instead of wasting their energies in the successive adoption and abandonment of different solutions of a given problem, two days are allowed after the posting of the larger problem of the month, within which time each student must fix upon some general scheme for his design, and show his idea by sketch plan and elevation on a small scale. These preliminary sketches are attached to the completed designs, which must correspond with them in all essentials. These sketches are criticized before the class, attention directed to their good and weak points, and while working up the scheme to the finished design the student has regular individual criticisms. At the end of each problem a criticism takes place before the class. Its value is such that no student will willingly miss it, and what is learned through this sizing up of one's work and by its comparison with that of others is the greatest aid in helping one to criticize himself and make the most of his reasoning powers.

The aim of the course in the History of Architecture is to make the student see that the styles simply represent certain points in the great march of architecture, that they developed naturally and logically in response to social and political conditions as they changed, and to the skilful use of materials in construction. That throughout this great movement construction was recognized as the basis of all good architecture. That the relationship is so close between these architectural periods that in this study not one of them can be slighted if the student is to have an intelligent understanding of the great monuments designed by former architects. This history is taught by lectures amply illustrated with the stereopticon, and by books and photographs. Each week the students are required to present for criti-

MASSACHUSETTS INSTITUTE OF TECHNOLOGY, ARCHITECTURAL DEPARTMENT—STUDIO LIFE CLASS.



A CITY HALL. BY F. N. EMERSON.

A CITY HALL. BY F. N. EMERSON.

cism abstracts and sketches of the historical monuments discussed. They are also required to test, by comparison with the works themselves, the descriptions and conclusions of the leading architectural authorities, and to prepare careful themes and drawings showing the results of their research. This personal investigation serves, besides, to give the students a good working acquaintance with the exceedingly valuable collection of books and photographs belonging to the department, and stimulates their appreciation of the best architectural works. The History of Architecture is completed in the third year, and is followed by a year's course in the History of European Civilization and Art, in recognition of the broadest aesthetic and historical training. The course gives an extended survey of political, ecclesiastical and social history, which is as necessary as architectural history in itself, if the essential spirit of Classical, Gothic and Renaissance art is to be fully grasped. The ages of highest achievement, moreover, have been also the ages of greatest distinction in sculpture and painting, arts which of necessity stand in a close practical relation to that of building. With these considerations in view, a course of study has been planned which aims at giving a general review of the history and characteristics of European civilization in the Classical, Gothic and Renaissance ages, and at familiarizing the student with their sculpture and painting. This course is illustrated in the fullest possible manner by lantern slides, of which in sculpture and painting the department has a collection of over two thousand subjects, and by a large number of specially prepared wall maps. Supplementing the work of the class-room, sets of photographs, well labeled for study, are exhibited in the architectural library, the collection being changed from time to time to keep pace with the work of the class. Ample provision has been made for books of reference and for collateral reading, of which a considerable amount is required of every student.

The extensive collections of the Museum of Fine Arts and the Boston Public Library, with its conveniently arranged art department, are both close at hand, and form a most valuable supplement to the resources of the Institute. Taken together, the facilities offered for a liberal aesthetic as well as practical training are such as few universities can rival.

Instruction in Ornament explains the historical development of ornament, and teaches facility in the general treatment of color in decoration, as well as the characteristics of different styles. Lectures are given, the problems are designed and rendered in color, and when finished are carefully criticized before the class.

Scientific construction is continually becoming a more necessary part of the architect's profession. His knowledge must be broad and thorough, and the practice of to-day shows that an architect should not only be a skilled artist, but should also be scientifically trained as to control intelligently all constructive questions.

The mathematical courses in Algebra, Plane Trigonometry, Analytic Geometry and Calculus, and the course in Physics prepare the way for the consideration of professional work in Applied Mechanics, Graphical Statics, and Strength of Materials. These are followed in turn by a short course in Constructive Design, which applies the knowledge obtained in earlier courses to problems often encountered in modern architectural practice.

In the third year the principles involved in different methods of Perspective and the simpler problems of Stereotomy are taught. In the latter course the methods of Descriptive Geometry, learned in the first year, are applied to the drawing of practical problems in stone cutting.

The study of Working Drawings and Specifications includes practical instruction in making quarter-scale plans and elevations from sketches of wood, brick and stone constructions, and in making the framing plans and working drawings of various kinds necessary in actual practice. Specifications are discussed, and the various materials used in modern

A MUSEUM OF WAR. BY L. E. KERN.

construction are described, such as cement, lime, mortar, brick, wood, stone, metals, etc., and their use by the mason, carpenter, roofer and plumber. Care is taken not to attempt details which may be better learned in an architect's office, but enough is accomplished to enable the student to take immediate advantage of office opportunities upon graduation.

The student is advised to spend a part of the summer in an architect's office. What he learns of office practice in this way during the vacations of his course is a great aid to him in the clearer understanding of his school work.

The course in Building Stones is specially designed to meet the needs of the students of architecture. The principal varieties of stones used for building and decoration are described and discussed with the aid of numerous dressed specimens, especial stress being laid on the distinguishing features, adaptation to use in various situations, strength and durability, occurrence and distribution and important instances of use. This work is followed by illustrated lectures on the methods of quarrying and dressing, the weathering and climatic relations and the selection and testing of stones. Excursions are made to granite and other quarries in the vicinity of Boston. This course is adapted to the needs of students who have done no previous work in geology.

The course in Heating and Ventilation is planned to acquaint the student with the fundamental principles of the subject, and the proper application of these principles to practice in the solution of a considerable range of problems in this field of engineering. The practical side of the subject is treated with as much thoroughness and fullness as is consistent with the primal aim of the course.

ARCHITECTURAL ENGINEERING

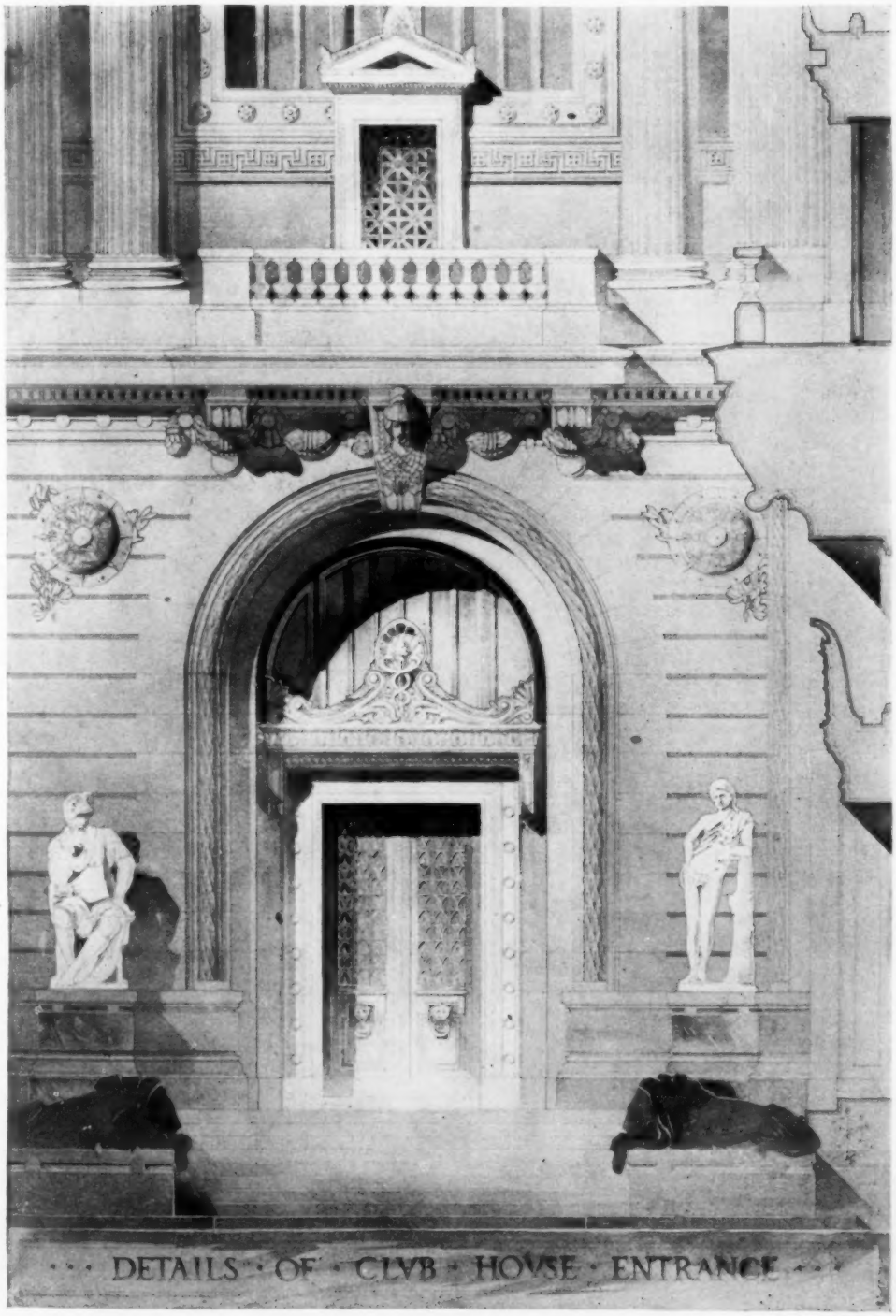
In recent years opportunity for specialization has been offered by the introduction of options in Architectural Engineering and Landscape Architecture for students not desiring to follow the general course in architecture. The option in architectural engineering meets the demand for men specially trained in the computation of all the details of modern steel construction which occur in the practice of architecture. It diverges from the other options at the middle of the third year, the general architectural training which the student has had during his first years being an important aid to him in his future career. His field of employment will be broader for this knowledge, for, as an architectural draughtsman his familiarity with the uses to which a building is to be put and his ability to take part in the regular routine of the architect's office, will make his services additionally valuable.

Lectures and problems on the principles of Applied Mechanics and lectures in the Theory of Structures, including loads and reactions, shears and moments, proportioning of beams, columns and tension pieces, the computation of plate and box girders, wooden and steel roof trusses, steel framing, wind-bracing, fireproofing, foundations, arches, etc., give the necessary preparation for practical problems in Structural Design, which forms the important feature of this course. In the fourth year a part of the time is given to laboratory tests on the strength of building materials.

Graduate students who have completed the regular course in architecture will find in the engineering option an attractive field of work.

SUMMER WORK.

Besides the regular work, the course of the department also offers in certain subjects summer instruction covering the same ground and given in the same manner as that of the regular classes. The courses are given by members of the department during July and August, and the subjects included are Second and Third-Year Design and Shades and Shadows. Courses are also available in Mechanical Drawing and Descriptive Geometry, and in the Modern Languages. For those who have had some previous training in these subjects there



A CLUB HOUSE ENTRANCE. BY I. P. LORD.

are also courses in Physics and Mathematics.

While these courses enable students who have incurred deficiencies during the school year to make them up before the next term, their principal object is to assist applicants for advanced standing, particularly students coming from other colleges, to complete the preliminary work of the second year, with a view to undertaking third-year work to better advantage, or even to give them the opportunity to complete the professional work in two years.

In addition to this summer instruction, a summer school is held whenever a class is large enough to warrant, for the purpose of bringing the students in contact with the practical side of building, and that they may learn to appreciate the true value of scale and detail. For this purpose localities are visited where buildings are to be found which are important as representative of style or character. These buildings are thoroughly studied, measured and photographed, careful sketches are drawn, and later complete drawings are worked out to scale.

The first summer school was held in 1893, in Chicago, during the World's Fair. In the following years schools were held in Salem, Mass., and Portsmouth, N. H., for the study of Colonial Architecture. The drawings made in these years have been published in the "Georgian Period," Part VII. In 1896 the Institute took the important initiative of sending the school to Europe, and a bicycle tour was made in England and France for the study of architectural styles. Next, the school made pencil and water-color sketches of the picturesque buildings in and about Quebec. After this the school again studied European Architecture, visiting cities in Northern Italy between Genoa and Venice and then made a successful bicycle tour to Paris for the study of the buildings of the Riviera, the Rhone Valley and the central part of France. Measured drawings were made at Venice and Arles, and sketches were made in most of the towns visited. Over 700 negatives were taken with hand cameras of important details, interesting buildings and local scenes, and the successful pictures were added to the library collections of photographs and lantern slides. Again the school returned to the study of Colonial work, making many measured drawings at Providence and Boston, and the last one spent four months in France and Italy.

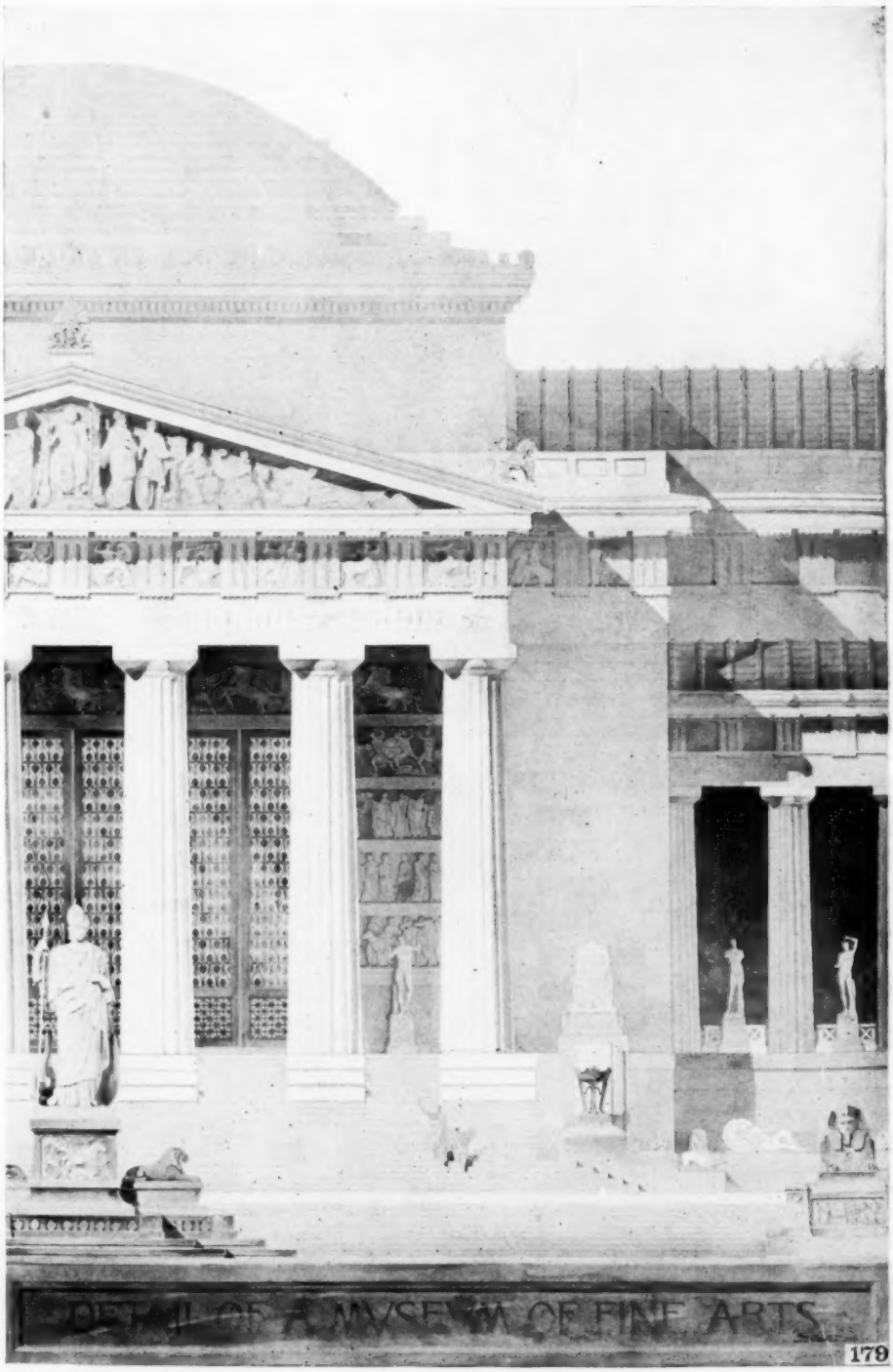
GRADUATE WORK.

The Institute offers, moreover, opportunities for one or two graduate years of advanced study, to be spent entirely in professional work. The value of such a course cannot be overestimated, for it allows uninterrupted and continuous study at the time when the students are exactly ripe for it. Such conditions are conducive to special effort, and the stride made from the very beginning of the fifth year is always surprising.

SPECIAL STUDENTS.

Persons applying for admission as special students in Architecture must be college graduates, or twenty-one years of age, with not less than two years' office experience. They will be required to pass, before entrance, examinations in Plane and Solid Geometry, and must include in their work at the Institute the regular first-year courses in Free Hand Drawing, Descriptive Geometry and Mechanical Drawing unless these subjects have been passed at a previous examination.

Graduates of colleges are admitted without the usual entrance examination, and will be permitted to enter any of the courses at such a point as their previous range of studies will allow. If prepared to enter upon most of the studies of a certain year, they may often be afforded opportunity to make up any studies of the earlier years in which they are deficient. They will, in general, be credited with all subjects in earlier or later years in which they can show, by examination or otherwise, a standing satisfactory to the Faculty, and may be received provisionally as regular students, subject to making up deficiencies in work of previous years within a limited time.



DETAIL OF A MUSEUM OF FINE ARTS. BY O. FAELTON.

Applicants presenting satisfactory certificates for work done at other colleges may be excused provisionally from taking the corresponding examinations at the Institute. Applicants for advanced standing should present themselves for examination (except in the case of those offering certified records from other colleges in this subject), and all applicants should submit drawings covering the above ground as fully as possible. In case these drawings are not satisfactory, further work and examination may be required.

PRIZES.

The department is fortunate in the active interest taken in it by the Boston Society of Architects. At the Society's annual meeting for choice of officers the appointment of a committee to visit the department is always made part of the regular routine, and the good precedent established as long ago as 1868 is regularly followed in offering two prizes of the value of $50 each in books for the best solutions of a special problem in design, to be made by the fourth-year regular and the fourth-year special students.

The two Rotch prizes of $200 each are given according to the will of the late Mr. Arthur Rotch, a former student and lecturer; one to the student who has graduated with the highest standing in the regular course in architecture, and the other to the special student who ranks highest at the end of a two years' course. For the latter prize only those applicants are eligible who enter in accordance with the requirements, on the basis of professional office experience or as college graduates.

SCHOLARSHIPS.

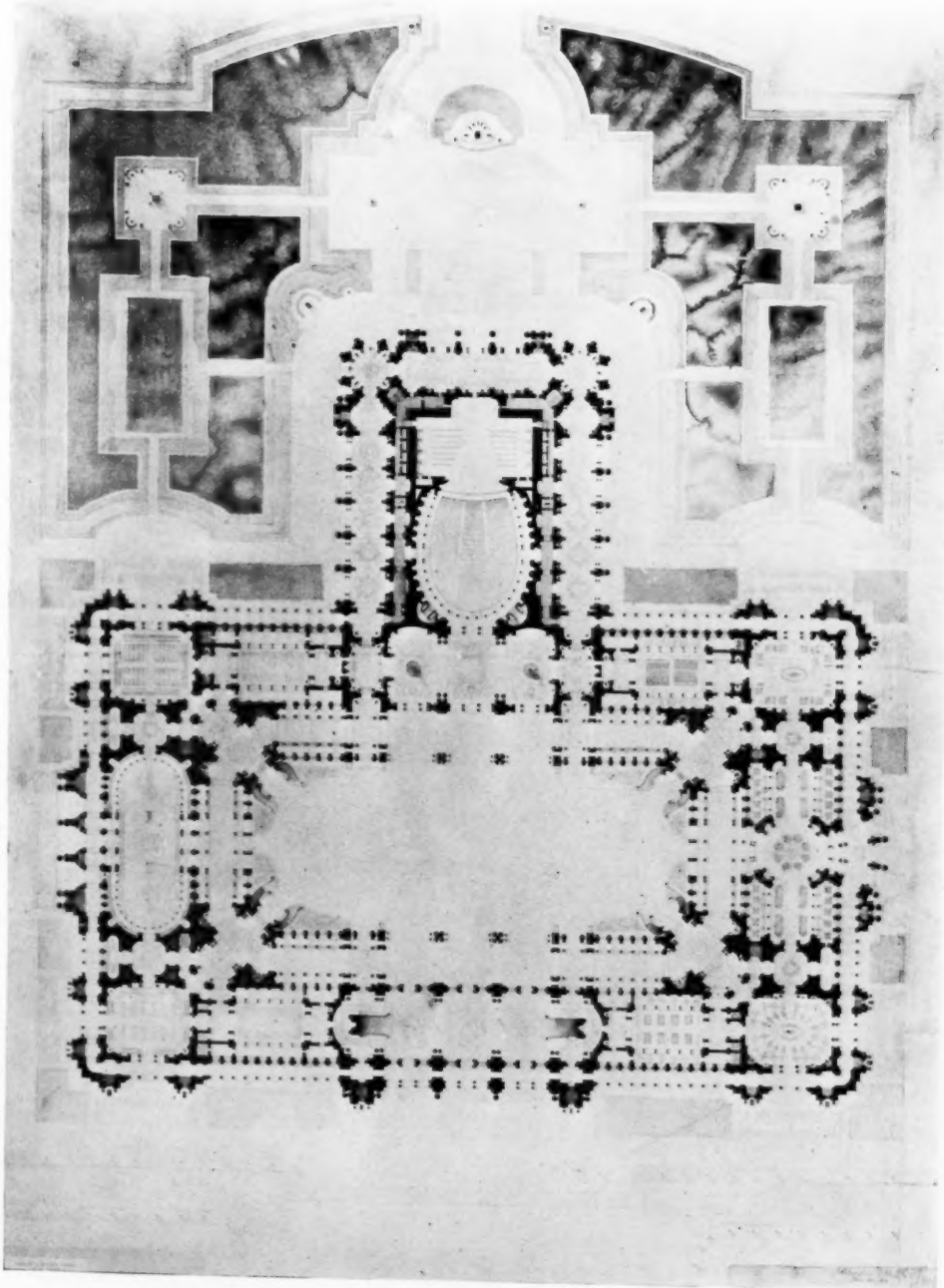
The resources of the Institute for undergraduate scholarships have been largely increased by recent benefactions. In regard to the application for these funds, and also for those of graduate scholarships and fellowships, the catalogue of the Institute should be consulted; but it may be said here that preference is given in making awards to applicants who have completed at least a year of thoroughly satisfactory work at the Institute.

The special legacy of the late W. B. Perkins and the general income of the Austin Fund for aiding students and teachers enable the Institute to make adequate provision for graduate traveling fellowships in architecture.

The annual Traveling Scholarship amounts to $1,200. The award is made solely on the basis of distinguished merit, as it is felt that the prize will thus possess a greater value for the advancement of architecture than if restricted to benefit only the regular or the needy student. Candidates, therefore, will be received from both regular and special students, but they must have passed two consecutive years in the department within the last three years, and at least one of the years must have been in the graduate class. They must, besides, have proved themselves during these school years to have been earnest students and of first-rate ability.

THE BUILDING.

For the third time since 1883, the department has had to change its location to meet the constant need of expansion. The present quarters in the Henry L. Pierce building gave at the time opportunity for increased accommodation, but the need of more space is again being felt. The library is very fully equipped and catalogued, and has every convenience for consultation of its 3,800 books, 16,000 photographs, 48 serial publications and 15,000 lantern slides. By means of a special fund raised for the purpose, several thousand books, photographs, prints, drawings and casts were originally collected for the department. To these collections large additions have been made by regular appropriations and by gifts. The adoption of the alcove system greatly assists in the effective use of books by bringing together works of the same style and subject. The exhibition room gives ample opportunity for the display and comparison of designs and sketches and the continuous exhibition of students' work. This room has associated with it the "loges" in which



PLAN OF A PEOPLE'S PALACE. BY F. W. PUCKEY.

the advanced students are isolated while preparing their twelve-hour sketch problems, and for the annual competition for the $1,200 traveling scholarship.

The arrangement of drawing-room has proved very satisfactory. Bringing together the third, fourth and graduate classes in the way that has been done gives the best results. In putting together between eighty and one hundred men of different degrees of experience and ability, in increasing the "esprit de corps" (which has never been wanting), in giving the younger class the benefit of direct association with older men, we have succeeded in combining in the regular instruction all the best qualities of the French atelier system. The rooms are crowded, but there are no complaints, and the amount of work accomplished leaves nothing to be desired. The large open alcoves into which the great drawing-room is divided is simply for the purpose of giving wall space on which to hang the valuable collection of drawings, prints, photographs and historic casts. So great a part of the education of the architect comes through his eyes that they should have the opportunity to rest on such objects of beauty as we are able to supply. The collections are particularly rich in the choicest work of the Paris "Beaux-Arts." Perhaps the most interesting group is Pascal's competitive drawings for the Hotel de Ville at Paris, a gift from Mr. Pascal himself. Among other drawings of this distinguished architect are those which won for him the Prix de Rome. Then there are the original "Envois de Rome," by such men as Tournaire, Chaussemiche, Recouré, Chifflot, and the drawings of Emanuel Brune, which still stand forth a monument of skilled technique, unrivaled in the architectural world, a library in themselves and a continued source of inspiration.

EXPENSES.

The tuition fee for regular students is $250 per year. For one-half or any less fraction of the school year, the fee is $150. Special students pay, in general, the full fee; but when a few branches only are pursued, and the time required for instruction is limited, application for reduction may be made to the Bursar. The fee for students in the Graduate Course is the same as that for regular students. It is desired that regular students whose financial necessities are such as to prevent their continuance at the Institute, communicate, through the Secretary, with the Scholarship Committee of the Faculty. The exercises of the school are held at such hours as to allow students to live conveniently in any of the nearer cities or towns, on the lines of the various railroads, if they prefer to do so. The cost of board and rooms in Boston and the neighboring cities and towns need not exceed seven or eight dollars a week. The cost of books, drawing instruments, paper, etc., is from twenty-five to thirty-five dollars a year.

F. W. Chandler.

Modern Foundations

No branch of engineering requires greater skill than the design and construction of foundations. The principles are simple, the first being that the supporting layers shall be at right angles, or nearly so, to the line of pressure, and the second that the pressure upon them shall be less than their safe bearing value. All important structures should be started below the frost line and care should be taken to prevent percolation which might undermine the footings. But the application of these principles has to be made under such varied and often difficult conditions as to require in general a new solution for each problem.

A foundation in its broadest sense is defined as "the basis or groundwork of anything." It is therefore both concrete and abstract and is universal. In this article it will be considered as that part of a building from the bottom of the excavation up to the ground surface. Its lower courses are the foundation footings and the material on which the footings rest is the foundation bed. The function of a foundation is to support safely the loads brought upon it by its own weight and that of the superstructure. Safety does not require that no settling shall occur but, if present, it is of the greatest importance that it shall be uniform. Unequal settling is a serious matter, causing excessive strains throughout the structure, producing cracks and other defects and may result in the collapse of the building. As in practice it is usually difficult to obtain uniform settling it is better whenever practicable to make the foundation unyielding. The materials entering into it should be as nearly indestructible as possible. Wood continually wet, brick, concrete, masonry and steel protected from moisture are all used with good results.

The load which a footing will carry depends directly upon its area and the nature of the material on which it rests. Even a poor soil can carry a large structure if the footings are of sufficient width. It is necessary to correct the popular idea that quicksand is some lurking monster that swallows up the unwary. The engineer's definition of quicksand is any loose friable material saturated with water. There are different kinds of quicksand just as there are different kinds of wood, varying from nearly as treacherous as the popular idea of it, to a material that may be safely built upon. The lower end of Manhattan Island is a quicksand extending from the surface to a maximum depth of eighty feet below Broadway. It will bear three tons per square foot and the foundations of many buildings rest upon it. Filled-in ground is one of the poorest materials on which to build, as for years after it has been deposited it will continue to settle and obviously any structure it carries must settle with it.

Ordinary ground will bear safely from two to four tons per square foot, dry clay from four to six tons per square foot, good gravel from six to ten tons and bed rock from fifty to two hundred tons per square foot. Sand if confined will stand very large pressures, and similarly water, the most unsuitable of all, if it could be restrained, would be capable of resisting an enormous pressure. Certainly no force man has produced is sufficient to injure its structure. It is hardly necessary to say that good bed rock is the best available material on which to build and has been so considered since biblical times. The Egyptians apparently gave little attention to their foundations. The compact soil, dry climate and absence of frost simplified the problem. They usually built their temple walls on a footing of stone or sometimes of sun-dried bricks, the bottom courses being five or six feet below the ground surface. While this construction answered in the main, it is

probable that the ruin of some of the great temples was caused by the failure of their foundations, due to the infiltration of the Nile overflow.

The Greeks gave the matter more attention, excavating to a considerable depth and building the footings of fine cut stone carefully laid dry. The Romans excelled all others of their time in their foundations. They excavated usually to rock and built spread footings of cut stone laid in cement. They used concrete extensively and were skilful in

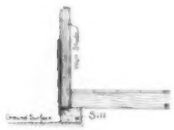


Fig. 1. The primitive foundation consisting of a wooden sill on the ground, with studs and floor beams resting on top.

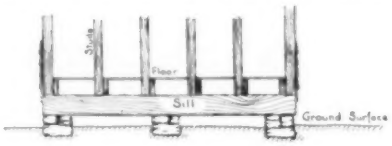


Fig. 2. The transition from the primitive to the dwelling house foundation.

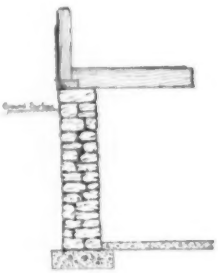


Fig. 3. Typical dwelling house foundation. A wall of rubble masonry.

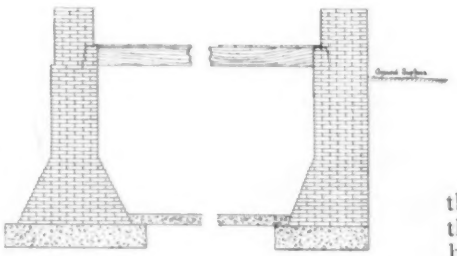


Fig. 4. The two types of spread footings —a development of the dwelling house foundation—suitable for buildings up to seven or eight stories.

subaqueous construction, using piles and cofferdams.

The foundations of modern structures may be divided into two classes: 1—those where the work is begun on ground above the water level, as for buildings; 2—those started on ground below the water level, as for bridge piers and light houses. This classification is somewhat arbitrary, as the methods used are often the same in both. The conduct of the work, however, is so different as to seem to justify the division. It is the purpose of this article to consider only those of the first class.

The most primitive form of foundation is shown in Fig. 1. As will be seen, it consists merely of a wooden sill, a piece of timber say six by eight inches in section, laid directly on the ground with the studs, the floor beams resting on top. As the load that such a foundation will carry is limited by the comparatively small area of ground on which it rests, and as it readily rots it should be used only for unimportant or temporary structures.

An improvement on this method is to raise the sill off the ground by putting it on occasional stones, as shown in Fig. 2, materially increasing the life of the sill. A further improvement is to rest the sill on a continuous course of stones increasing the bearing area on the ground. This is the usual construction for barns.

The next step in the development of the foundation which has been built oftener than any other is that of the ordinary dwelling house, Fig. 3. It is merely a wall, usually of rubble masonry, brick or concrete, 16 inches thick, or more as shown. It is generally started somewhat below the cellar floor and extends above the ground level. For ordinary frame houses the thickness required for the cellar walls usually gives sufficient bearing on the ground; but it is better to start them on a wider footing course. It will be clearly seen that this is a direct development of the shed and barn foundation, the improvement being the solid masonry wall started below the frost line.

For larger buildings where the weight would overload such a foundation a wider footing is obtained by offsetting the foundation walls (Fig. 4), giving a

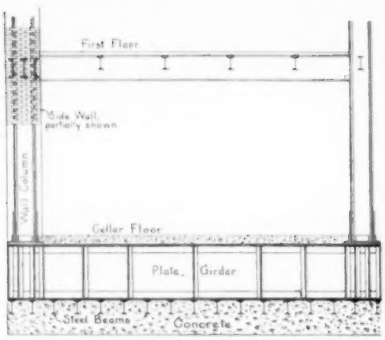


Fig. 5. The steel grillage foundation, designed for a high office building resting on quick sand.

much wider bearing on the ground and proportionately increasing the weight which may be safely carried. This is known as a spread footing, which should not be sloped more than 30 degrees with the vertical. If the offsets may be made equal on both sides any width of footing may be obtained by going deep enough, the only limit being the volume of masonry required. The economical limit of the spread footing when resting on ordinary ground is reached when a building exceeds five to seven stories. If owing to adjoining buildings the wall may be offset only on one side the effective limit of offset is reached when the footing course is about one and one-half times the width of the wall at the nearest tier of beams above, for if it is more than this it will distribute little or no pressure under the toe. This is a fact that has often been overlooked by architects and builders.

An example of this fault was recently found in an eleven-story office building in the lower part of New York City. Its foundation was a spread footing resting on quicksand and owing to an adjoining building one of the foundation walls was offset on only one side. The width of the supported wall was four feet and the width of the footing was more than 10 feet. It was assumed that the pressure would be distributed over the entire footing, but as we have stated above, about four feet of this was ineffective, the pressure on the remaining six feet was proportionally greater, exceeding the bearing value of the sand, and the wall slowly and steadily settled. After a number of years the foundation was reinforced at a cost of nearly $50,000.

The use of steel in building construction has developed a modification of the spread footing by using one or more layers of steel girders or beams, those of each layer being set on and at right angles to those of the layer below, making what is known as a grillage. The steel should be thoroughly protected from moisture and each layer should be embedded in concrete. This type of construction, shown by Fig. 5, and also by the central pier of Fig. 6, has been used to a considerable extent in New York and very largely in Chicago. Even where the grillage rests on quicksand it can carry heavy loads, having been successfully used for buildings of more than 20 stories. In such cases it has to be made so large as to cover almost the entire area of the cellar floor. Its advantage over the spread footing is that a much greater bearing may be obtained without going to excessive depths. The objection to such a foundation, however, is that any disturbance to the adjoining soil is liable to allow the quicksand to flow, and this unchecked would eventually wreck the building. A proposed subway route in New York under a narrow street along which are several high buildings with foundations of this type has recently been abandoned, as in the opinion of a foundation expert the construction of the subway would be fatal to these buildings.

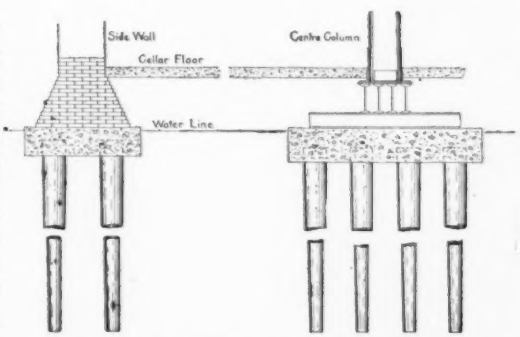


Fig. 6. The familiar wooden pile foundation, with combination of spread footing and steel grillage.

Probably the foundation best known to the layman is that on wooden piles. Their use is very old, having been used by the Romans and in a primitive form by the Lake Dwellers of Switzerland some 6,000 years ago. For wood to endure it must be kept perfectly dry or thoroughly wet. As the former is impossible it is essential that wooden piles should be entirely below the water-level. In New York City the ground water-level changes from time to time, and there have been several instances in which it has receded below the tops of piles, causing them to rot; to remedy this defect is a difficult and expensive matter.

The pile of commerce is a round stick of timber generally about six inches in diameter at the lower end and twelve inches and upwards at the butt, and varies from 20 to 60 feet in length according to the depth to which it is to be driven. The load a pile will carry depends upon the hardness of the soil on which it finally rests and also on the amount of friction of the earth on the surface of the pile. Piles resting on a soft bottom may bear considerable loads merely by friction, though, of course, it is better where possible to drive them to hard soil. When the latter is obtained a pile will sustain, depending on its size, 20 tons or more.

In making a foundation of piles, after they are driven to the required depth, the tops are cut off below the water-level, capped with timber or more usually with a course of concrete on which the walls or column piers are built. Fig. 6 shows a cross section of a typical pile foundation, the side walls having a spread footing so as to cover three rows of piles and the center columns resting on a grillage which covers a group of piles. Such a foundation, if properly designed, will carry very high buildings. The Park Row building in New York rests on such a foundation.

The objections to the use of piles are: 1, the danger of the water level receding below their tops; 2, in some localities they may be injured or destroyed by the teredo; 3, the rapid increase in the cost of wood; 4, the slight displacement of the soil and the vibration produced in it when piles are driven, may crack and injure the walls of adjoining buildings.

Piles are now made successfully of concrete. One method of making them is to force the concrete into hollow moulds in which a system of steel reinforcing rods has first been placed, thus forming a monolith of reinforced concrete. The moulds are removed when the concrete has set and the pile is then ready to be shipped to the building site,

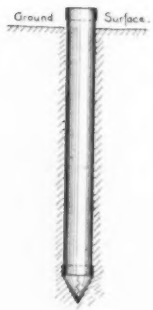


Fig. 7. Sectional View of steel shell of concrete pile driven to hard ground.

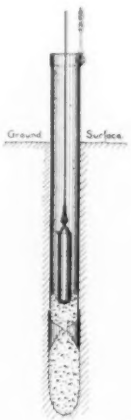


Fig. 8. Steel shell partially withdrawn and the concrete being rammed.

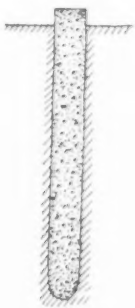
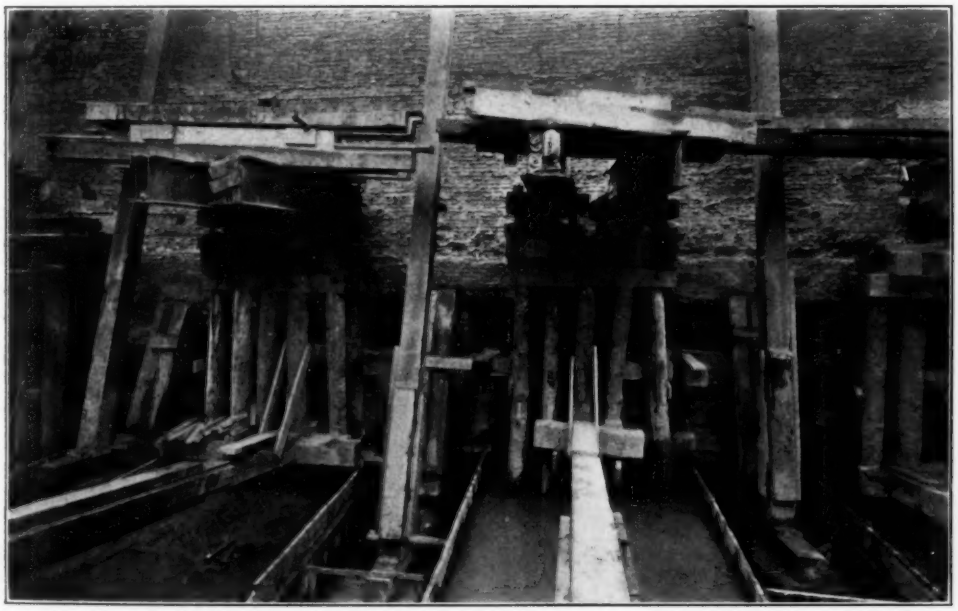


Fig. 9. The finished concrete pile.

where it is driven like a wooden pile. There is some difficulty in making these piles tough enough to stand the blows of the pile driver.

Another and better way is to make the pile in the ground. This is done by driving steel pipes to the required depth and filling them with concrete and withdrawing them. The pipes used are of uniform diameter, from 14 to 20 inches, according to the size of the pile desired. To the lower end is attached a steel point called an "alligator jaw." This is made in two halves, so that when the pipe is being driven the pressure of the earth keeps the halves tightly closed, but when the pipe is being withdrawn they are free to open. The pipe is driven with an ordinary pile driver fitted with a powerful hoisting tackle. When the required depth is reached, the pipe is filled to a height of about three feet above the lower end with concrete by means of a special dumping bucket. The pipe is then pulled up one or two feet, the jaws opening and the concrete remaining stationary. The concrete is then rammed with a drop hammer till it compactly fills the hole. This operation is repeated till the concrete is brought to the required height and the pipe is entirely withdrawn. Fig. 7 shows a sectional view of the pipe driven to hard ground. Fig. 8 shows the same pipe partially withdrawn and the concrete being rammed, and Fig. 9 a view of the finished pile.

Of all foundation construction, that resting on rock is the best, and the modern tendency is to start important buildings on it even when the cost is considerably greater, but it is well to point out that, other things being equal, a rock foundation is the cheapest, for as figures of bearing values show, rock has the greatest carrying capacity, and therefore the piers or footings resting on it may be made the smallest. The ideal economical condition is to have level rock just below the proposed cellar floor; if the rock is higher the expense of cutting it out is large, and if

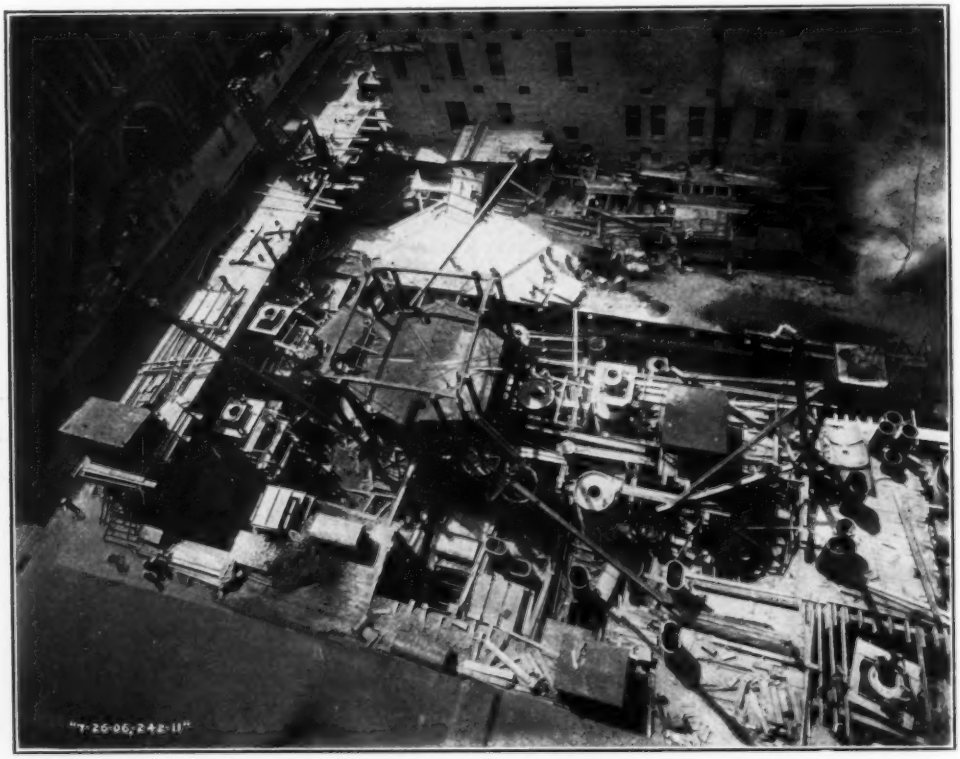


METHOD OF SHORING ADJOINING BUILDING FOR FOUNDATION OF ROYAL QUEEN BUILDING, NEW YORK.

In this construction driving needles are carried on temporary piles.

it is lower there is the additional cost of carrying the footings down to it. The cost of building on rock is therefore not due to the type of construction but to the fact that the rock may lie at such a level that it is very costly to get at it to begin the work. This is the condition found in the lower part of New York City. Rock lies from 60 to 93 feet below the Broadway curb, and on top of this is a hardpan from 5 to 18 feet thick. Above the hardpan is quicksand extending to the surface. The ground water level averages about 23 feet below the curb, so that there is a maximum head of water of 70 feet. The only possible way to reach the rock is by the pneumatic caisson, for any other method is sure to undermine the footings of adjoining buildings.

A pneumatic caisson may be described as a powerful box, open at the bottom, and having a strong flat roof about six feet above the lower edges. The latter are reinforced by steel, making a cutting edge. The space below the roof is the air chamber, and it is here that the men work. Caissons vary largely in size, but an average one is eight feet wide and twenty feet long and is built up vertically in sections about 15 feet high. Fig. 10 shows a sectional view of the type of caisson used recently in the foundation of the Singer and other buildings. From the roof of the air, or working chamber, a shaft about three feet in diameter extends to the top, making a passage for men and materials. At the top of the shaft is the air lock, which works on the same principle as



BIRD'S-EYE VIEW, SHOWING CAISSONS IN VARIOUS STAGES OF SINKING AT THE U. S. REALTY BUILDING, NEW YORK.

On this foundation the world's record for sinking pneumatic caissons was made; 70 caissons 75 feet deep were sunk in 60 days.

the canal lock and affords a means of entering or leaving the higher pressure of air in the shaft and working chamber.

The air lock is a steel cylinder about five feet in diameter and seven feet high, bolted to the top of the air shaft. There are two doors, one at the top and one near the bottom. A man called the lock tender always stands on its top to regulate the air valves and open and shut the doors. When a man is to go down into the caisson the lock tender shuts

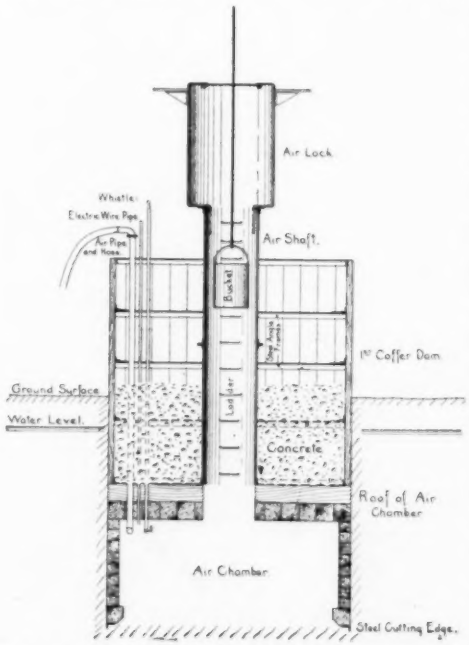


Fig. 10. The pneumatic caisson. Sectional view of a caisson in process of being sunk, showing the caisson about 15 feet under ground, the cofferdam half filled with concrete and the bucket being lowered to the air chamber. The cofferdam construction of planks bolted to steel frames is shown above the concrete. This improved air lock is the invention of Daniel E. Moran, C. E., of the Foundation Company.

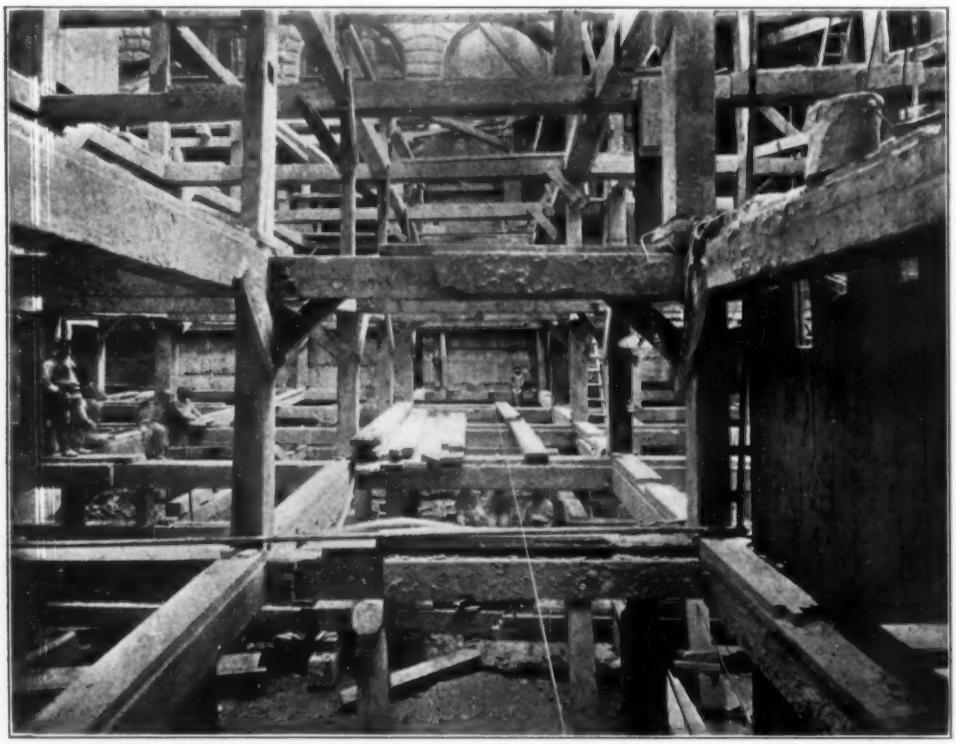
the lower door, opens the upper door, and the man goes in. The lock tender then closes the upper door and opens a valve allowing the compressed air in the shaft to flow into the lock till the pressure is equal in both. The lower door is then opened and the man climbs down the shaft on a ladder provided for that purpose extending all the way down to the working chamber. The closed upper door prevents the compressed air from escaping. When the man comes out again the process is reversed, and if a bucket is to be sent in or out of the caisson the method is the same. The number of men working in a caisson depends upon its size; some are so small there is room for only one man, while in others eight to ten men work at a time.

In starting a foundation contract the first thing that the contractor does is to see that the walls of the surrounding buildings are in good condition, for if necessary they must be shored and braced, for even a pneumatic caisson may disturb the soil while being sunk. The equipment is then brought to the site and made ready for work. This includes installing the air compressors and connecting them with lines of air pipes, which are laid at convenient places over the lot so that they in turn may be connected by flexible hose to the caissons, and thus deliver the air supply to them. The derricks, which must be strong enough to lift the 20-ton caissons into place, must be set up in such places that they will cover the greatest area and yet not be in the way of the work as it progresses. Heavy platforms must be built so that trucks can be driven within reach of the derricks to receive the material as it is excavated from the caissons. Room must be made for storing cement, sand and broken stone for concrete and other material. Small shops must be built for pipe-fitting work, blacksmithing and general repairs. When this and much more has been done the air chamber section of the first caisson is brought on a heavy truck and driven under one of the derricks, which lifts it off and lowers it to the exact location where it is to be sunk. An additional section, called a cofferdam, is then put on top of the air chamber section—the caisson proper—and sometimes a second cofferdam section is put on immediately thereafter. These cofferdams are somewhat like the air chamber section, except they have no roofs and are of lighter construction. Their object is to confine the concrete, with which they are filled, till it has set, and sometimes they are

removed before they reach the ground level and only the hard concrete filling sinks with the caisson. (See Fig. 9.)

The pipe-fitting gang bolts the sections strongly together, puts on the air shaft and air lock, puts in one or more vertical pipes for the air supply, another to carry electric light wires to the working chamber, and also a pipe at the upper end of which is a whistle for giving signals. Carpenters have meanwhile built a strongly braced frame around the caisson to act as a guide while the sinking process takes place. A concrete mixing machine is started and the concrete is filled into buckets and hoisted up and then lowered down into the cofferdams and deposited on the roof of the caisson.

The "sand hogs"—the men who work in compressed air—now go down the shaft to the working chamber and begin to dig, excavating the earth uniformly all over the area enclosed by the caisson. The material is hoisted in a bucket and dumped into carts which take it to scows sent out to sea for its final disposal. As the earth is dug out the caisson settles by its weight and that of the concrete which is being continually added above the roof. Soon the ground begins to get wet and then by opening a valve a small air pressure is admitted to the working chamber, the pressure being just enough to force the water out and make the sand dry. This process is continued until rock is reached. Of course the deeper the caisson goes the greater is the pressure of the water trying to force its way into the working chamber, and this has to be overcome by constantly increasing the air pressure. For a column of water 68 feet high the air pressure must be about 30 pounds per square inch above that of the outside air or 45 pounds per square inch.



DOWN IN THE FOUNDATION OF THE COMMERCIAL CABLE ANNEX, NEW YORK.

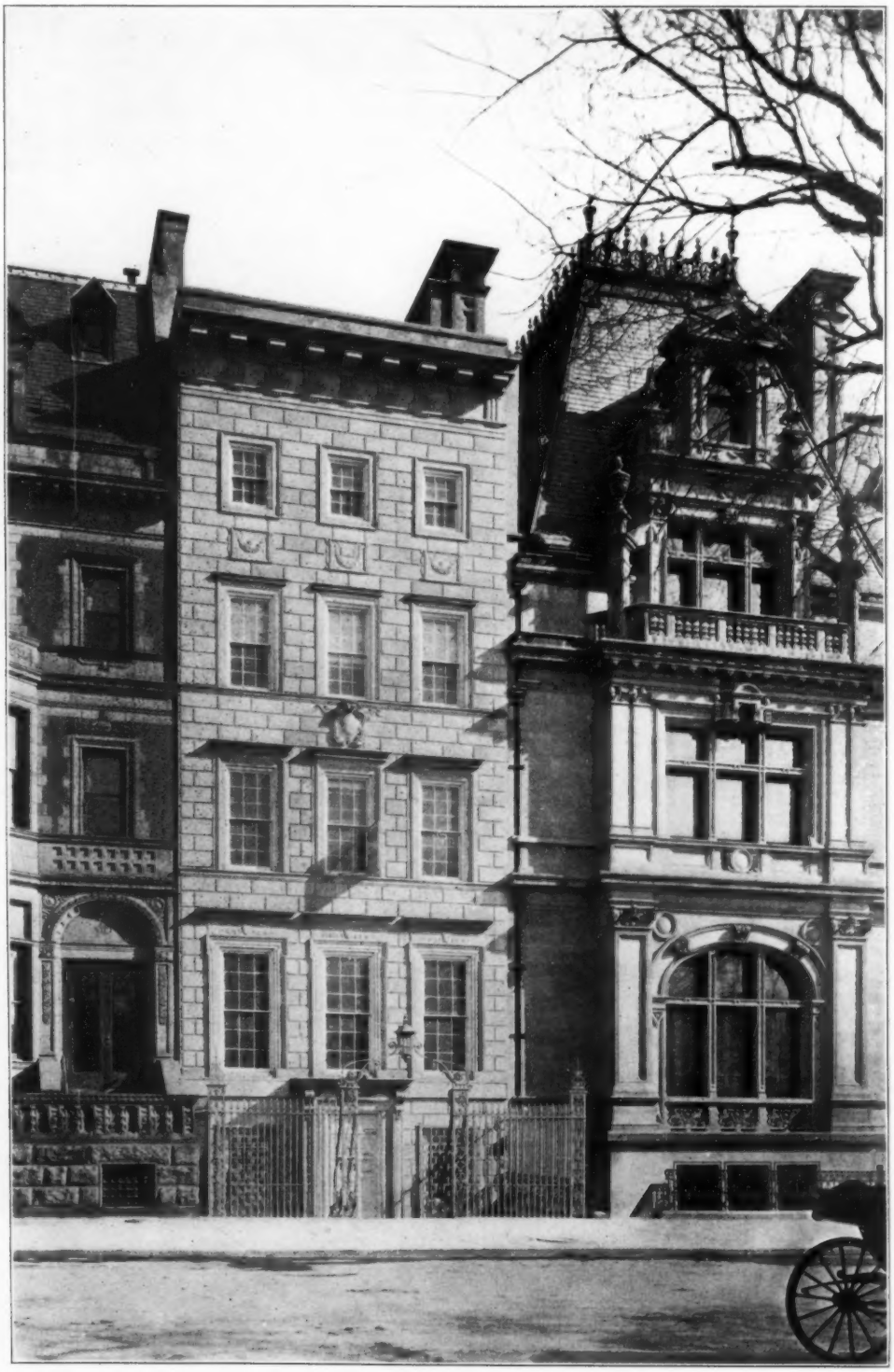
When all the earth has been removed and the rock cleaned off, the next thing is to fill the air chamber with concrete. This is well rammed in place, the work being done from the edges towards the center so that finally the concrete extends tightly packed from the rock to the roof and only a little space is left under the shaft, the space being the smallest that one man can occupy while he empties the last bucket of concrete, and this done he goes up the shaft, which is then filled by throwing in concrete from the top.

Let us see now what has been accomplished. Resting on the rock there is a solid mass of concrete, rammed tight against the roof of the air chamber. Above the roof is another solid block of concrete extending to a little below the cellar floor line. This gives an indestructible pier resting on rock on the top of which the columns of the building are set. There has recently been adopted an ingenious method by which the caisson roof is removed so that the concrete is one continuous mass from the rock to the top. The description given of the one caisson applies to all the others of a building and work on several caissons is carried on at the same time.

It is necessary for the men working in the caisson to be able to communicate quickly with the persons outside, and for this purpose a special pipe, previously referred to, extends from the working chamber to the top, a whistle being fitted to its upper end. There is a valve in the lower end of the pipe and when opened the compressed air rushes up and blows the whistle as it escapes. The number of blasts indicate such things as "more air wanted," "reduce air pressure," "pull up the bucket," etc.

The dangers in caisson work are: The chance of accidentally flooding the working chamber; risk of fire, and caisson disease, known as "the bends." The first is very rare with a skilful contracting engineer. The use of electric lights reduces the second to a minimum. But science has done very little in fighting the disease. Not much is known about "the bends" beyond the fact that all men working under air pressure are subject to it, and the effect is to produce a powerful and exceedingly painful contraction of the muscles. Medical science can do nothing for it and a bad attack is apt to be fatal, and it sometimes cripples a man for life. If, as is usual, the attack comes on in leaving the caisson relief may sometimes be obtained by the man's going back again and coming out very slowly, the air pressure in the lock being very gradually reduced. The danger increases with the air pressure, it being rare when the pressure is under 20 pounds. The practical limit of pressure under which men can work is 45 pounds. The hours the men work necessarily vary with the pressure. Up to 20 pounds they work for four hours, then a half hour rest, when each man receives all the coffee he wants, then three and a half hours' work, making an eight hour day or three shifts every twenty-four hours. At 45 pounds the men only work for forty-five minutes at a time. These pressures are all given per square inch above the atmospheric pressure.

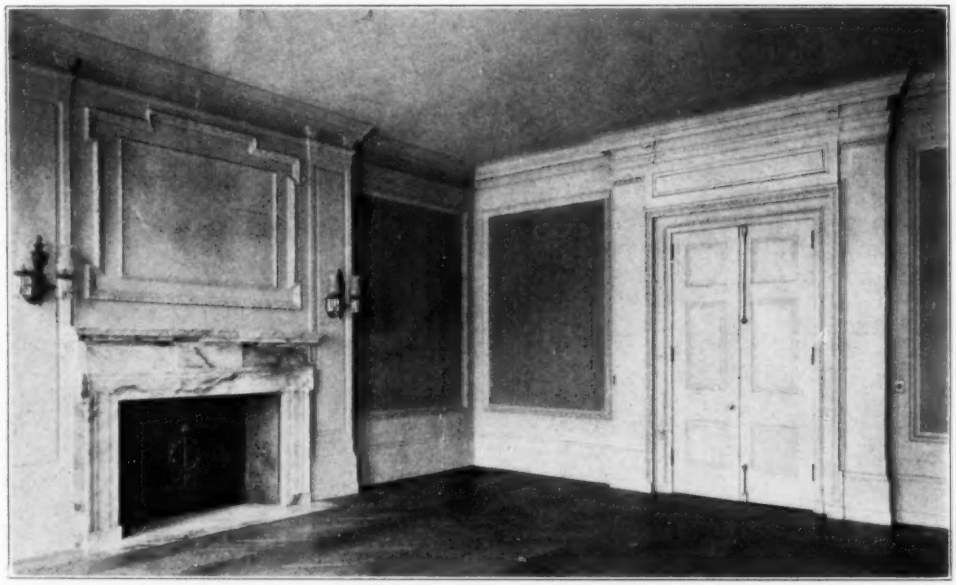
Work of this magnitude is necessarily expensive and requires considerable time, but the results much more than warrant it for all important structures. The time taken to sink the caisson depends somewhat on its size, on the depth of sinking and on the amount of hardpan excavated. The record for speed was made in 1906 on the extension of the Trinity Building and U. S. Realty Building, where 87 caissons 75 feet deep were sunk in sixty days.



RESIDENCE, 844 FIFTH AVENUE, NEW YORK.
(Photo by A. Patzig.) Chas. A. Platt, Architect.

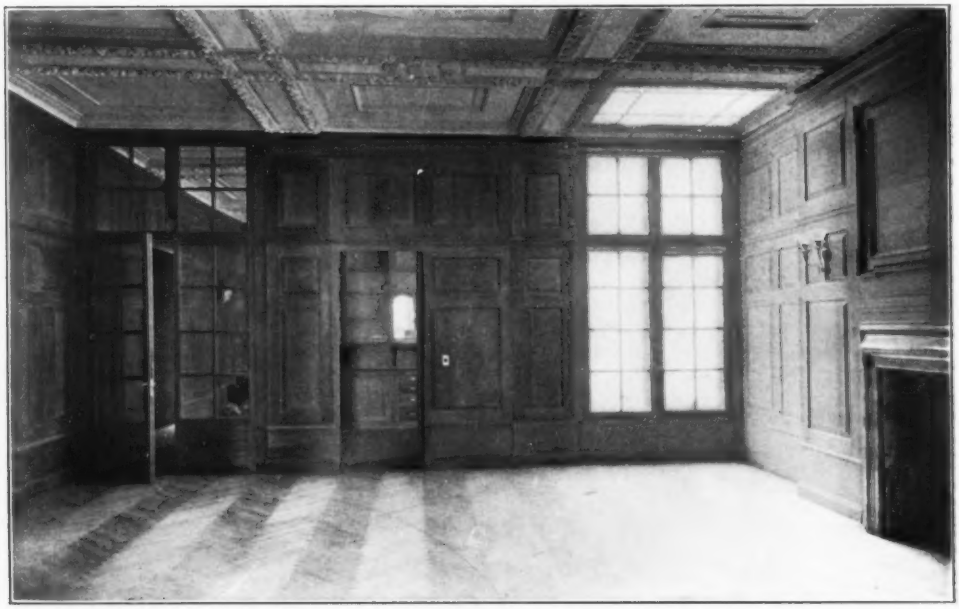
Residence, 844 Fifth Avenue, New York

The house illustrated herewith, which is situated at 844 Fifth avenue, in New York City, is a good example of the excellent results in the way of a New York residence which can be obtained by the use of comparatively simple and inexpensive means. An old four-story brown-stone house formerly occupied this site, and the Astor estate, which owned the property, proposed to substitute for this antiquated structure a new building, which should be designed and planned in accordance with the standards of convenience and good looks which now prevail in respect to private houses on Fifth avenue. In planning the new building, however, it was necessary constantly to keep economic considerations in mind. The building was not being erected for the occupancy of its owner. It was erected because a modern dwelling promised to rent better than an antiquated one. Money, consequently, could not be spent as freely as it would be in case the house was intended to satisfy the special needs of a rich man. As much money was appropriated as was necessary to build a house which would conform in all matters of taste and convenience to the best standards prevailing in New York; but every dollar which was spent had to be well spent for the purpose. It was not only a thoroughly good result which was wanted, but a good result which was obtained without unnecessary expense.

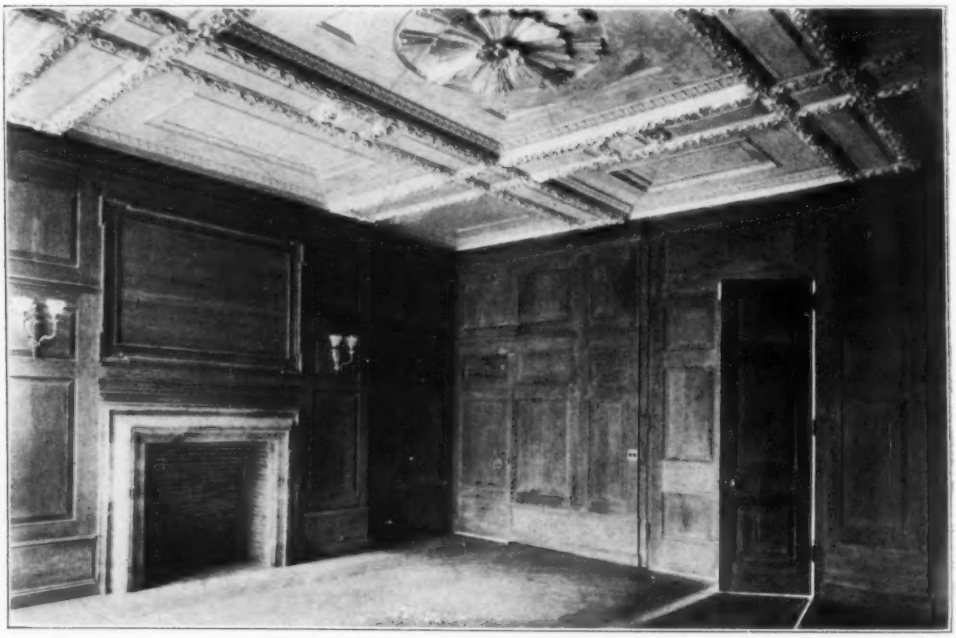


RESIDENCE, 844 FIFTH AVENUE, NEW YORK—DRAWING ROOM.
(Photo by A. Patzig.) Chas. A. Platt, Architect.

The architect has been very successful in meeting these conditions. He has designed a building which is adapted in every respect to be the residence of a family of refinement and wealth. It is both a more completely finished and better-looking dwelling than many private houses on Fifth avenue which have cost twice as much, while at the same time the money spent upon it was not so great that the rent will not yield a fair return on the investment. Every detail of the building has an air of quiet but positive good taste. It is as far as possible from

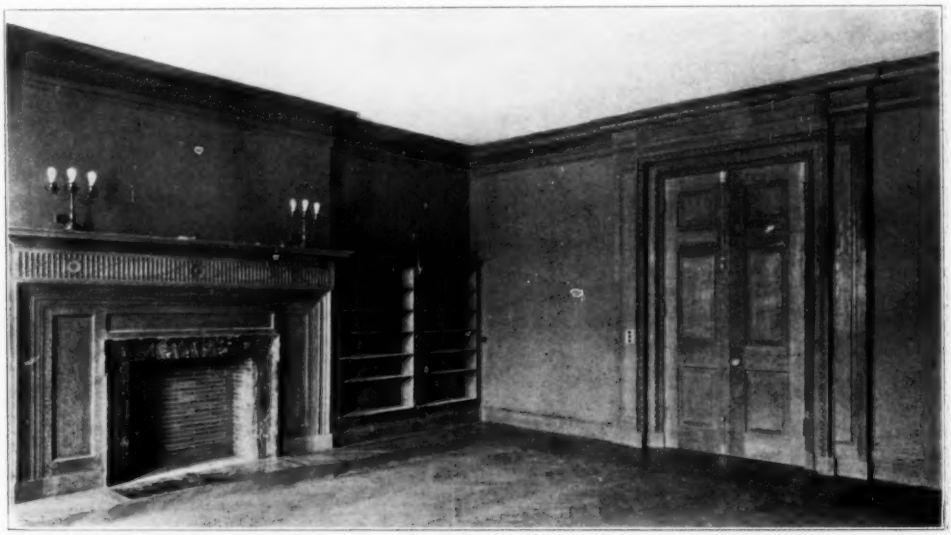


RESIDENCE, 844 FIFTH AVENUE, NEW YORK—THE DINING ROOM, LOOKING TOWARD PANTRY AND KITCHEN.
(Photo by A. Patzig.) Chas. A. Platt, Architect.



RESIDENCE, 844 FIFTH AVENUE, NEW YORK—THE DINING ROOM, FROM THE KITCHEN.
(Photo by A. Patzig.) Chas. A. Platt, Architect.

looking either cheap or ready-made, and it may be doubted whether there is another dwelling in the city, built particularly for the purpose of being rented, which possesses as much distinction combined with so little ostentation. A speculative builder, when he is confronted by a problem of this kind, usually spends a lot of money in loading the entrance hall with marble and in gilding the most important semi-public rooms in the house, while at the same time putting stock finish in the bedrooms and using wherever possible beneath the veneer cheap and unpermanent materials. Such methods produce poor results both in appearance and as a matter of economy; and it is refreshing to find a house which has been erected subject to stringent business conditions and which remains an appropriate residence for a gentleman and his family.



RESIDENCE, 844 FIFTH AVENUE, NEW YORK—LIBRARY.
(Photo by A. Patzig.) Chas. A. Platt, Architect.

One of the conditions imposed upon the architect, Mr. Charles A. Platt, was the preservation of the floor levels which had obtained in the old brown-stone dwelling, and this condition determined in large measure the limitations and the character of the design of the street front. The entrance door and hall are on the level of the former basement, and they can be reached only by descending a few steps into a sort of a well. It was impossible, consequently, for the architect either to give much architectural emphasis to the entrance or to compose the front of the building so that the different floors should each have a radically different value in the design. These conditions of a comparatively unimportant entrance and stories of practically the same height have been frankly accepted in the design. No attempt has been made to compose the front in an elaborate and artificial manner. The architect has sought to obtain his effect solely by the use of effective materials and a careful attention to detail. The front is dressed with a warm grey stone, which is pleasant both in texture and color, and this stone has been carefully cut at the joints, so as to fall into an attractive pattern covering the whole of the front. The windows with their small panes of glass fit admirably into this scheme. Those of the second story are framed in a somewhat more emphatic manner than their neighbors immediately above, while on the top floor they are appropriately very much reduced in

size. The conditions to which the designer was obliged to conform add a touch of stiffness to its mixture of firmness and delicacy, but the architect is to be congratulated on the frankness with which he has accepted the difficult conditions and the successful result which he has none the less obtained.

The front part of the ground floor is occupied by the entrance floor, and the rear by the kitchen and servants' quarters. An attractive staircase leads to the second floor, which contains the drawing-room on the front and the dining-room on the rear. The woodwork in the first of these rooms is light. The important architectural members of the room, the doorway, the windows and the panels, are emphatically framed by pilasters, and the panels in the walls can contain a fabric adapted to any kind of hangings which the occupant of the house may desire. The treatment of the room is both delicate and positive and it will require equally careful furnishing in order to properly complete the effect. The dining-room in the rear of the same floor is paneled to the ceiling with dark wood, and it makes both a handsome and dignified room. It is lighted by a large window and skylight at the right; and the effect of this window has been ingeniously balanced on the other side of the room by glass doors leading out into a small smoking room or den. The architect is peculiarly happy in devices of this kind, which turn to excellent account some of the unfortunate practical conditions of an interior design. The front room of the floor above is the library, which is also finished in dark wood, but which is not paneled. The effect of this apartment has been made much more gay by the rich though comparatively inexpensive subdued gilding of the architectural detail.

RESIDENCE, 844 FIFTH AVENUE, NEW YORK—STAIRCASE HALL.
(Photo by A. Patzig.) Chas. A. Platt, Architect.

NOTES & COMMENTS

SOME TIMBER HOUSES IN NORWAY

There is but little timber architecture anywhere—real timber architecture—not wood frame construction. And that little is but little known. Least known are the beautiful buildings of Norway excepting, perhaps, the famous stave churches that find their way into every history of architecture.

If you are interested in what is original and yet purposeful in every detail do not pass lightly by these pictures from the far North.

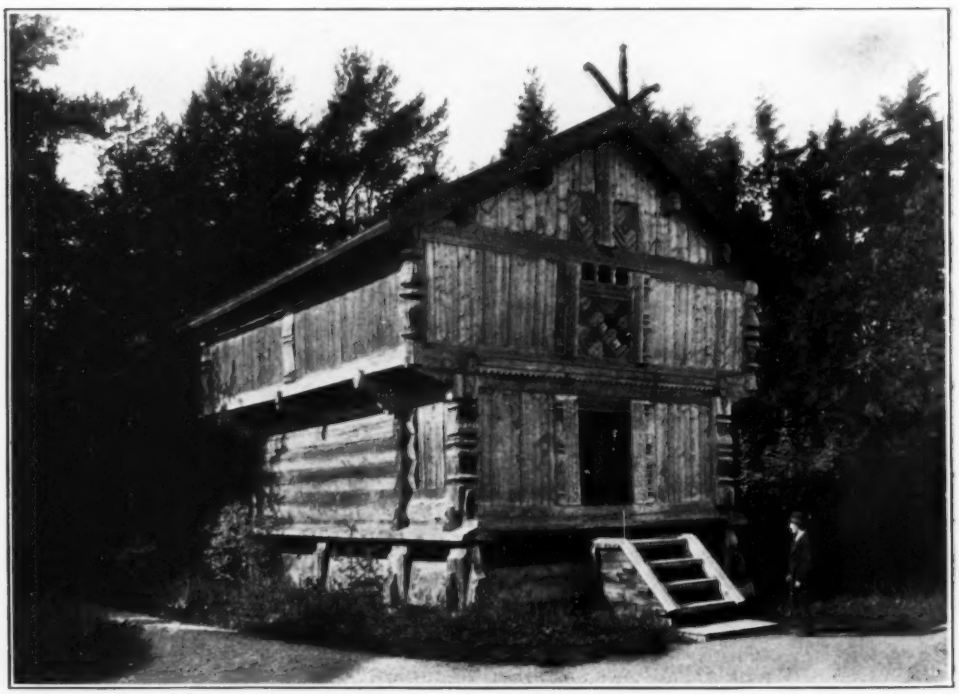
STABUR FROM TELEMARKEN, SAID TO BE THE OLDEST DOMESTIC BUILDING IN NORWAY.

A Norwegian "gaard" of the more pretentious sort consisted of several structures that made up the farmstead. These were grouped in a somewhat irregular manner about a court, thus forming a fortress in troublous times. Each structure was separate for ease of erection and to reduce danger from fire.

A wealthy nabob would have three houses to live in, one for winter, low ceiled and warm, one for summer open to the rafters, and one for guests, a large hall with one end partly screened off for the women and an open gallery at the other end for sleeping quarters. Then there were storehouses for clothing and food. It was on the exterior of these storehouses that the builder lavished his thought and energy, for they were the outward proof of his importance in the community—more so than the house in which he lived.

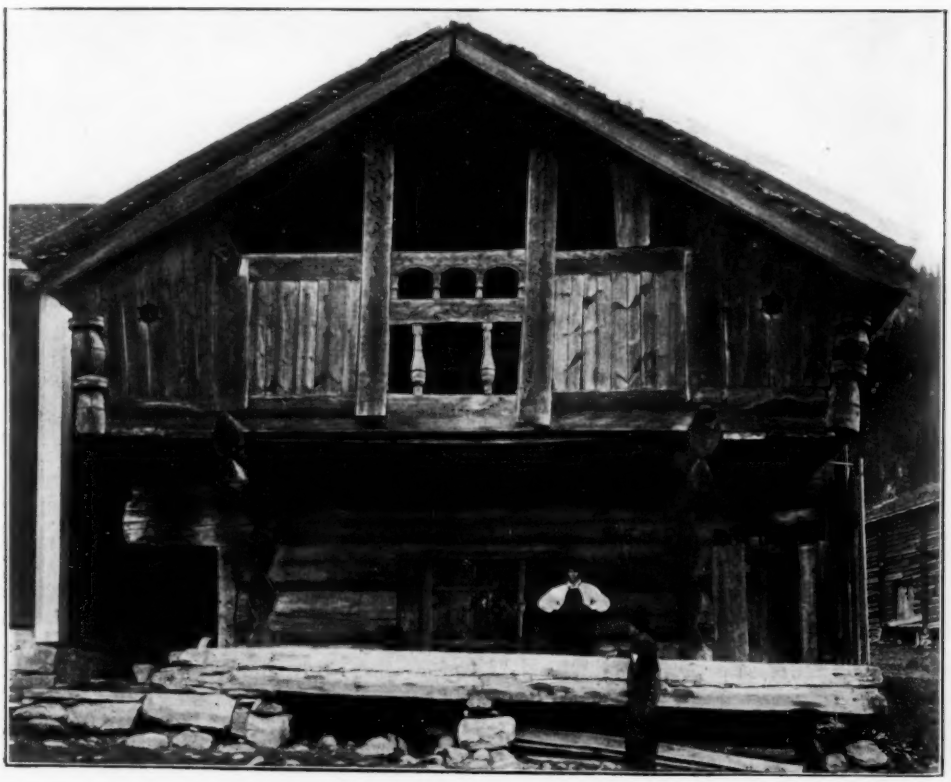
Besides these there were 20 or 30 other structures, such as kitchens, brew-houses, bakeries, stables, servants' quarters, etc. The storehouses are called stabur (long a and u) on account of their being raised from the ground on stones at the corners to protect them against vermin and moisture. It is these structures that distinguish Norwegian work and attract attention with their bold, naïve construction, the overhanging second story, the rich carving, the turning and the scroll sawing, and the plain,

STABUR IN BREDLAND, TELEMARKEN.
(Of the 17th century.)



STABUR FROM TELEMARKEN, NOW ON BYGDOE.

STABUR IN NAES, HALLINGDAL.
(Of the 18th century.)



LOFT FROM OSE, TELEMARKEN.
(Of the 17th century.)

unadorned sod roof. They are invariably of two stories. In the first story were kept the grain and other foods, in the second the clothing. This second story projected on one or three and sometimes on all four sides forming a gallery called a svalgang, or cool walk. It was constructed thus to protect the lower story from heat and wet, but also as a last resort when the enemy pressed hard. Here a determined stand could be made with the advantage of fighting from above. Five stabur and lofts are given to show the variety and treatment, for no two are similar in spite of the general resemblance. The lofts were built same as the stabur, only not raised from the ground. The stabur from Telemarken is supposed to be the oldest piece of domestic building still extant in Norway, and is dated 1115. Though probably not so old, it is certainly curious enough and shows the very humble beginnings. The sod roof is not the least of its picturesque elements. Perhaps less effective than thatch, it is far more practical, being fireproof and very lasting. The foundation is of birch bark, and this is the real roof which must be put on in a workmanlike manner. Then comes the sod laid on edge a foot thick and seeded. The result is a heavy roof, warm in winter and cool in summer. It is even to-day the standard way of covering in the countryside.

Perhaps less striking and bold in design than the stabur, the log residence is hardly less interesting. Fortunately the few good examples of timber construction still to be found are, at least in some cases, being taken care of. There are two collections: one near Christiana on a beautiful island of Bygdoe, which was begun and fostered by the now deposed King Oscar II. In Lille-

LOFT FROM BJOLSTAD, NOW ON BYGDOE.
(Of the 15th or 16th century.)

hammr far up in the beautiful valley of Gudbrundsdalen, is another begun by an energetic dentist, Herr Sandvig, and now become a public trust turned over to a society of which the original founder is still an unsalaried official. In this open air museum one can study the growth of the Norwegian home; the slow, almost imperceptible, steps from the first type, a reproduction of the original tent to the two-story house.

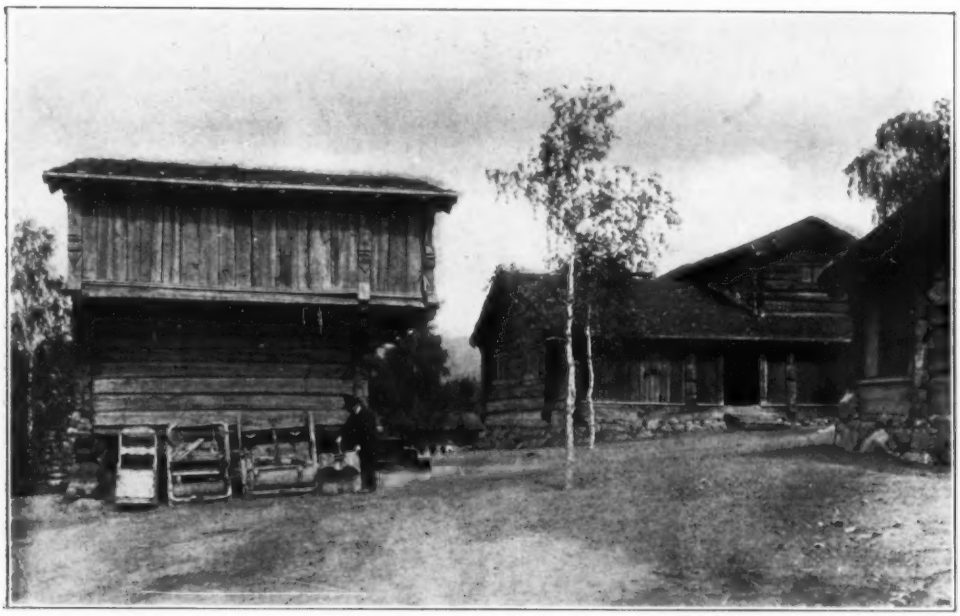
The earliest abode was a log enclosure without windows—a door on one side, port holes for shooting at the enemy, and a trap door in the roof for the escape of smoke and the inlet of air and light also when not too

stormy. The porch is no doubt later. Fire was built on the ground in the middle of the room on a large stone. One room was partitioned off. Such a one was Aaresstuen from Vooge.

The next step was to improve the fireplace. It was moved to a corner and walled up on two sides. Tradition ascribes this innovation to King Olof Kyrre about the end of the 11th century. As yet there were no chimneys. About the year 1200 royalty made another innovation, for it is said King Sverre introduced chimneys. Whether he invented them or just stole the idea, as he stole other things when he was out on some viking tour, is veiled in mystery. At any rate it was quite a change, and there soon followed windows and doors.

A third type was evolved by ceiling the small room over level and thus gaining an attic at one end of the house. By raising the roof of this attic above the rest and making a full story a picturesque type resulted. This room was called the maiden chamber, and the type called ramloftstuer, of which only three are known to exist. They are the highest development of the Norwegian log house, a fine, well-proportioned structure which suffers at the hands of the photographer. Last comes the full two-story house, of which two types are given. What more fascinating bit of porch design could be asked for than this with overhanging svalgang of Bjolstad. The heating of the second story was made possible by the cast-iron stove. Three interiors show the simple home life. The large hospitable open fireplace, the immense chairs carved out of a solid log, the table of planks 4 inches thick, the spinning wheel, the loom, and the numerous household articles, the products of sloyd, all bespeak the long, long winter evenings, when sagas and stories handed down from father to son took the place of

SKETCH PLANS OF NORWEGIAN HOUSE—PLANS SHOWING THEIR DEVELOPMENT.



FROM THE SANDVIG COLLECTION, LILLEHAMMR.
Stabur to the left, Ramloftstue from Loekre (about 1660) to the right.

the modern newspaper. And who shall rise up and say they were less happy? By their fruit ye shall know them," and verily their architecture, the fruit of their busy hands and brains, betokens a happiness and a serenity such as is given to few to enjoy in these days of automobiles and tram cars. O. Z. C.

A NEW SCHOOL HOUSE PLAN

The application of "the cottage plan" to school houses has been successfully tried in Pueblo, Colo. A whole block is utilized for single story structures, and while this would make the cost prohibitive in large cities where land is very valuable, yet the plan should be practicable, if desirable, not only in the town but in outlying sections of cities. The report from Pueblo is exceedingly favorable; and not the least merit of the plan is that it permits of a modest beginning to which additions may be made as the surrounding population increases and needs are multiplied. A big building is usually either ahead of or behind present requirements. Fire danger, both in loss of life and property, is reduced to a minimum; problems of light and ventilation are simplified, and the sanitary gains of various sorts are considerable. The following advantages are also mentioned: There is a greater field for individuality on the part of both teachers and pupils, the teacher is able to take part in all exercises, and each room is independent in regard to discipline. The view from the ground floor is more attractive to children. Classes may have recess at different times. Stairs, with their accompanying danger, noise and fatigue, are eliminated. The artistic possibilities are greater. Music, exercises and games in one room do not disturb the sessions in another room. The school ceases to appear like an institution, and the personal side of teaching is emphasized—with a resulting greater attraction to the child and betterment to the teacher.

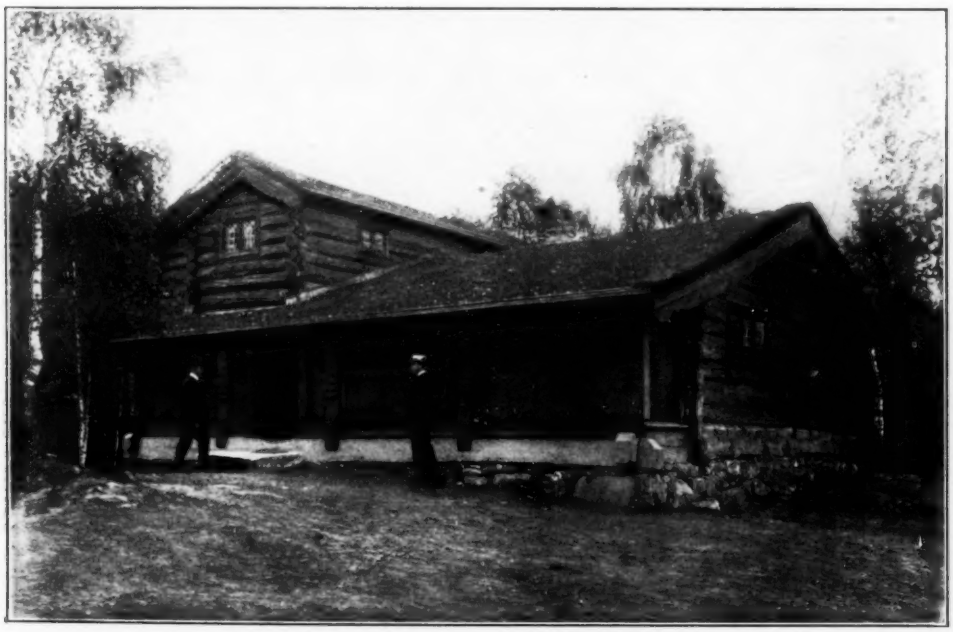
CITY PLAN EXHIBITION

There was held in Toledo a few weeks ago, through the co-operation of the Toledo Museum of Art with the Chamber of Commerce, a city plan exhibition. City plans have been a feature, and of late an increasingly important feature of municipal art exhibitions. But this is perhaps the first time in the United States when they have been the sole subject of one. Yet they are now numerous enough, and sufficiently elabor-

ate, suggestive and varied to make an exceedingly interesting exhibit. That in Toledo was open for a week, there was a very large attendance, and the exhibition proved a gratifying success. The Washington plans, which the Toledo papers describe as coming "in a special car, weighing a ton, and including 300 plans," were shown, as were those of Cleveland, Denver, Honolulu, Harrisburg, Buffalo, Oakland, and other cities.

REPLANNED COPLEY SQUARE

The improvement of Copley Square in Boston is of much more than local Boston interest. For many years the matter has been talked about, as well it might be. With the beautiful library framing one side, Richardson's Trinity Church as balance on the other, with the Art Museum occupying part of a third side, and the leaning tower of the "New Old South" at a corner; and finally with the city paying enormous damages—after years of litigation—to preserve an harmonious sky line around the open space, this little square has been the best known municipal art spot in the country. And yet its ground treatment through all these years has been barbarously inartistic. One cannot blame St. Gaudens for having taken so long to complete the sculpture for the front of the library, when one thinks what has been the square's surface development. It must be at least a dozen years since the Boston Society of Architects began to agitate an improvement. It secured plans through a competition; and at last, through the friendly offices of a councilman, and the pulling together of all forces, the city government has lately appropriated $40,000 for the improvement. The order was signed by the Mayor in the presence of municipal art workers, and the pen was saved as a souvenir. The plans adopted are those of C. Howard Walker. There are created four grass plots, arranged symmetrically on the axis of the museum and the library, the present streets forming the outside boundaries of this plotted area, and the two diagonal avenues intersecting at the centre of the square. At this point there is laid a pattern pavement. The grassed areas, planted with low shrubs and trees, and surrounded with sidewalks, are further adorned with lamps, fountains, etc. Copley Square will at last be more nearly what one might reasonably expect.



FROM THE SANDVIG COLLECTION, LILLEHAMMR.
Ramloftstue from Hjelter (1556), banquet hall with gallery.

AN IMPORTANT BILL

Andrew Wright Crawford, of Philadelphia, scarcely needs introduction to persons interested in municipal improvement topics. In addition to his knowledge of city park requirements, his enthusiasm and tireless energy in their behalf, in Philadelphia, he is an assistant city solicitor. In this joint rôle he drew up the bill presented to the Pennsylvania legislature to permit cities to buy land abutting on an improvement, for the purpose of reselling it. As this is a novel municipal authority, urged by the New York City Improvement Commission and widely discussed throughout the country, where there is envy of the ease with which foreign cities are by this means enabled to undertake improvements of which the cost would otherwise be prohibitive, there will be general interest in the terms of the bill. This is the greater because the Pennsylvania constitution is particularly restrictive at this point. The original draft, which has been sent to this department by Mr. Crawford, shows that the first section gives to cities the right to acquire land for the purpose of making or enlarging parks, parkways, or playgrounds. The second and third sections read:

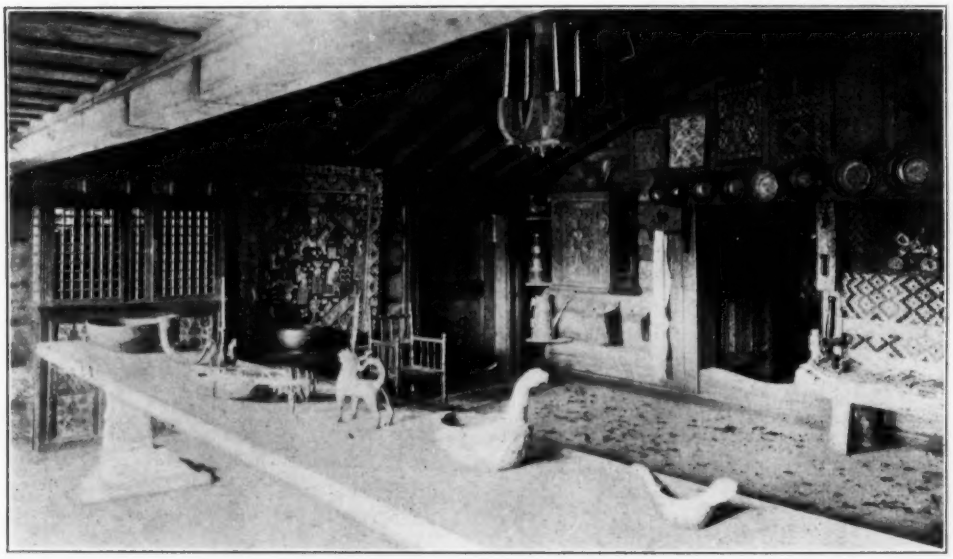
"Section 2. It shall be lawful for and the right is hereby conferred upon cities of this Commonwealth to purchase, acquire, enter upon, take, use and appropriate neighboring private property within two hundred feet of the boundary lines of such property so taken, used and appropriated for public parks, parkways and playgrounds, in order to protect the same by the resale of such neighboring property with restrictions whenever the Councils thereof shall by ordinance or joint resolution determine thereon, provided that in the said ordinance or joint resolution the Councils thereof shall declare that the control of such neighboring property within two hundred feet of the boundary lines of such parks, parkways or playgrounds is reasonably necessary in order to protect such public parks, parkways, or playgrounds, their environs, the preservation of the view, appearance, light, air, health or usefulness thereof."

"Section 3. That is shall be lawful for and

FROM THE SANDVIG COLLECTION, LILLEHAMMR.
Parsonage (1550), Captain's house in background (1750).

the right is hereby conferred upon the cities of this Commonwealth to resell such neighboring property with such restrictions in the deeds of resale in regard to the use thereof as will fully insure the protection of such public parks, parkways and playgrounds, their environs, the preservation of the view, appearance, light, air, health and usefulness thereof, whenever the Councils thereof shall by ordinance or joint resolution determine thereon."

The fourth section declares such use of the land to be "for public use," and the fifth and final section provides that the adjustment of compensation and damages, where the city and private parties are unable to agree, shall be in accordance with the existing legislation that covers this point when the acquirement of park lands is under discussion.



FROM THE SANDVIG COLLECTION, LILLEHAMMR.
Interior Ramloftstue Loekre (1660). Banquet hall showing gallery.

AMERICAN ARCHITECTURAL TENDENCIES

There was much of interest in the thoughtful paper by R. Clipston Sturgis, of Boston, which was read a few weeks ago before the Architectural Association. His title was "General Tendencies of Modern Architectural Design in America, and American and European School Work." He reviewed briefly the architectural history of the country from Colonial days; and coming to modern times found for our architects, as compared to European, two great advantages and one great handicap. An advantage is that the American student, traveling everywhere, goes "with the eager eye of one to whom all is new and wonderful." Unlike the Englishman, the Frenchman, or the German, he has no native prejudice, is hampered by no conservative respect for the work of his own people. The other advantage is that "architects in the United States are largely drawn from the class who have the means for a thorough education as a foundation." Thus our students who travel "are generally men well equipped intellectually to take full advantage of the opportunities offered them." These advantages have had, he thinks, a two-fold result: On the one hand, the wealth of accumulated ideas and the lack of established precedent have incited to new effort; on the other, the study of the fine old examples has encouraged a sincere and deep rooted admiration and a modest following of precedents. The discouraging tendency of our architecture, says Mr. Sturgis, "is its individualistic character." This he finds to be "the natural outcome of our form of popular government." A result is that we are "so absolutely lacking in distinguished civic architecture. No autocratic power, either of an individual or of a group of men, has as yet been sufficiently interested in large architectural schemes as to ensure

their execution." We have no Napoleon, or London County Council, and no populace temperamentally imbued with the love of art or by inheritance subservient to law and order as is the populace of Rio de Janeiro or of Buenos Aires. But, he adds, "in view of recent developments, we may await this issue with more patience and courage, for city after city has awakened to a sense of its lost opportunities in the past only to determine that those that lie in the fuure shall not be lost. Here at least we are reaping the benefit of the big exposition groups, and the lesson they taught of the value of concerted action, of standard dimensions and repeats, of a well considered whole in which the parts, while admitting variety, yet conform to the general law controlling the whole." For the development of these plans, he says, we must depend on the people for support, and hence the plans must be rational and practical. On the whole, American architecture in his opinion has passed the stage of student and copyist, and is "entering—slowly, but surely and carefully—on the more responsible period of an imaginative handling of well-understood laws."

WHERE PARIS LAGS

One of the most prominent officials of Paris has formally cited American cities as offering models of what Paris ought to do. M. Forestier, the Inspector of Forests and Commissioner of Boulevards, Walks and Avenues, has lately brought out a report in which he discusses "Large Cities and Park Systems." He shows, says a review in *Revue Horticole*, that "Paris, shut in by its fortifications, is at present a far too overcrowded city. After the admirable effort of Haussman and Alphand, it has, as M. Forestier states, committed the error of halting midway and of failing to further develop its park system. It has failed to foresee that its uninterrupted development demanded the proportional development of its breathing spaces, its parks and walks. . . . The number of inhabitants for each hectare of park grounds, which is only 51.4 at Meriden, Conn.; 94.7 at Boston, 206.4 at Washington, 214 at San Francisco, and even 400 at Vienna, is 1,354.7 at Paris! In quoting these figures, M. Forestier points out that they would be lower if the calcula-

FROM THE SANDVIG COLLECTION, LILLEHAMMR.
Interior Loekre Stue (1660), showing grandfather's corner.

tion had been made to include the parks of Meudon, Saint Cloud and Versailles, the woods of Verrieres and the forests in the vicinity of Paris, which have not as yet been included in a plan of grounds to be reserved for the city, and the future preservation of which is not certain. In the interior of Paris, however, there are only 247 hectares of garden spots and parks open to the public, and it will within the next few years have the smallest area of breathing places and public parks of any of the large cities of the world. M. Forestier then quotes the examples of American cities. To numerous good residents of those cities who—not waiting until they die to go there—have thought of Paris as short of Paradise, this "inside" confession will be startling. To some others, aware that in municipal park work we have a foremost place, it will be only a gratifyingly convincing recognition. But even as such it is notable.

NEW YORK IMPROVEMENT COMMISSION

The final report of the New York City Improvement Commission, recently submitted to the Mayor, contains many plans and illustrations that are all directly germane to the text, instead of being mainly illustrative of work done in other cities, European and American. That is now becoming fairly familiar; and what one wants in his civic improvement library to-day are new pictures of proposed plans, and not additional pictures of the same old scenes and places. Of course in many communities, where the appeal must be popular, and where the public is presumably less familiar with Washington, Boston, Paris, Berlin and Hamburg, than is the intelligent section of New York's public, the illustration of what other cities have done is exceedingly important, much strengthening the argument. As to the recommendations of the New York Commission, these are numerous. They were so fully exploited in the press that there is no need to rehearse them here, and almost every one of them was tentatively put forward in the preliminary report two years ago, and was discussed at that time. The issue of that preliminary report may have been necessary, but it was a tactical mistake. Through it the final report was shorn of novelty—without which a thing can hardly attract public attention nowadays. This was done with no compensating gain, for the plans were then suggested with such modesty and "perhapsness" that they carried no weight. No city had greater need than New York that such a report be issued with every attendant factor favorable, and while the commission has put in a deal of honest work, and has made many excellent suggestions, it is doubtful whether New York, as a whole, will be much altered as a direct result of the report.

The Board of Estimate of New York at a recent meeting resolved: "That the plans and drawings accompanying the report of the New York City Improvement Commission to the Mayor and the Board of Aldermen be filed in the office of the Chief Engineer of the Board of Estimate and Apportionment for the information of the Board in the consideration of future improvements, and that the said Chief Engineer be instructed to report to the Board of Estimate and Apportionment as to which of these plans it would be practicable to carry out by proceedings involving assessments for all or a portion of the expense, which should be carried out at the expense of the city at large, and also which of said plans could advantageously be officially approved by the Board of Estimate and Apportionment at the present time."

This is well so far as it goes, but it does not go far enough. The Chief Engineer of the Board of Estimate ought, one would say, to have been, whether he was or not, an ex-officio member of the Commission. The report ought to involve his official sanction of the plan, not necessarily as a plan to be immediately carried out. Immediate execution would involve a huge outlay. Mr. Pendleton, the Chairman of the Commission, has ingeniously argued that for this outlay, how great so ever it may be, the city would be able to recoup itself by condemning lands and afterwards reselling them at the advanced valuation which would accrue in consequence of the improvements. He even argued that this procedure might be practicable under the law as it stands. If not, he insisted that it ought to be made practicable by an amendment to the constitution of the State.

But these questions, interesting as they are, are not the actual question. The actual question is whether the report of the Commission provides a judicious scheme, an "ideal plan" of reconstruction, showing a wise prevision of the growth of New York, and deserving of execution if the question were a new and open one, and the city a "tabula rasa," or clean slate. We are all agreed that the Commission appointed a hundred years ago did not provide such a project,

or anything like it. If now, in the light of a century's experience, the present Commission has succeeded in gauging better the actual conditions of the city and forecasting more wisely the lines of its future development, the city ought to say so. That is to say, it ought to adopt the "ideal plan" as if the city were in fact a "tabula rasa" to be executed, as to any part of the city, when that part of the city does become a "tabula rasa." Of course this can come about only through disaster and calamity. But we have so many examples. If Chicago had had after its great fire of a generation ago, if Boston had had after its great fire of not much nearer date, if Baltimore had had after its great fire, if San Francisco had had after its earthquake and fire, a plan of improvement which commended itself to the municipal government, and if this plan had been conditionally adopted and ready to be put in execution when the calamity had done its work, every Chicagoan, Bostonian, Baltimorean, Franciscan would admit the enormous benefit of such a municipal provision. New York is not immune to any of the disasters which have befallen these sister cities, excepting, if even excepting, the seismic disaster of San Francisco. Why should not New York be warned in time? Why should not New York have a conditionally adopted plan of reconstruction, a plan to be executed if and in so far as calamity laid open to a wiser reconstruction any part of it which might thus have become a "tabula rasa"? Really, we know no satisfactory answer to this question.

A STOCKBRIDGE MEMORIAL

There are two reasons at least why the Sedgwick memorial, for which the Laurel Hill Improvement Association of Stockbridge has been collecting subscriptions, is especially deserving of note in this place. One is that the association is the parent town improvement society in the United States—the first of what has become a mighty horde. The second is the singular attractiveness of the memorial's design—its uniqueness, appropriateness, and beauty. From early days, the Laurel Hill Association has held open air meetings in a grove, where a huge granite boulder has made a sounding board for the speaker who stood before it. The memorial, designed by Daniel C. French and the detail work done by Augustus Lukeman, consists of a platform of small field boulders, with an upright monolith as reading desk, and a stone seat at the back for the presiding officer and the speakers, while back of all towers the great natural boulder. Bronze ornaments on the reading desk support wreaths of leaves when there is a meeting, an inscription in bronze letters is on the seat, and the platform bears a bronze tablet, describing the whole as a memorial to Henry Dwight Sedgwick, for many years president of the association. The character of the association and the importance of its meetings may be judged by the fact that last year's speaker's included Secretary Bonaparte and former Ambassador Choate.

SEDGWICK MEMORIAL ROSTRUM—BRONZE TABLET.

Stockbridge, Mass. Daniel C. French, Augustus Lukeman, } Sculptors.

A PLEA FOR AN INDIGENOUS ART

THE ARCHITECTURAL RECORD

JUNE

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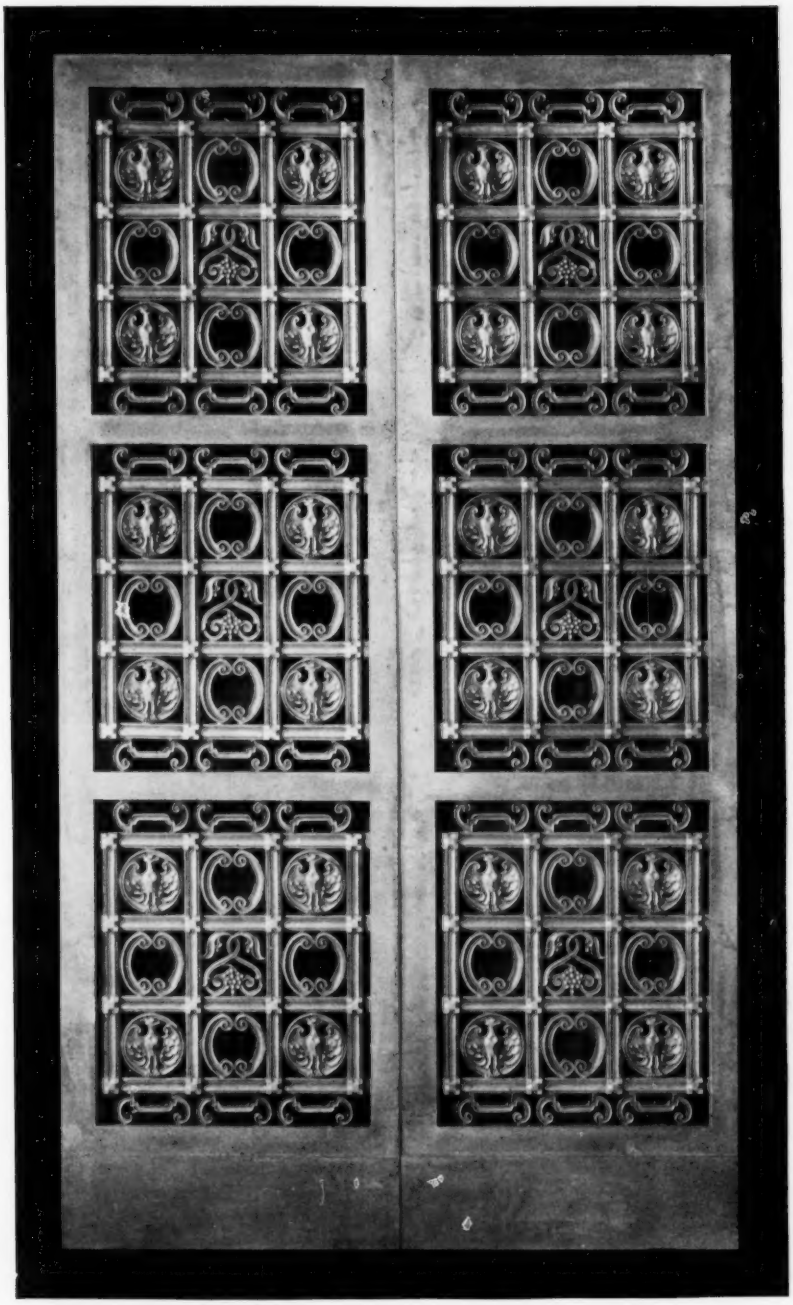

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Concrete Steel & Tile Construction Co., 17 Congress St., Detroit, Mich.
Corrugated Concrete Pile Co., 1170 B'way, N. Y.
Expanded Metal and Corrugated Bar Co., Frisco Bldg., St. Louis.
General Fireproofing Co., Youngstown, O.
Tucker & Vinton, 156 5th Ave., N. Y.

Concrete Piles.
Corrugated Concrete Pile Co. of America, 1170 Broadway, N. Y. C.
Raymond Concrete Pile Co., 135 Adams St., Chicago.

Concrete Stairs.
Columbian Reinforced Concrete Co., 26 W. 26th St., N. Y. C.; Times Bldg., Pittsburg, Pa.
White Fireproof Construction Co., 1 Madison Ave., N. Y. C.

Consulting Electrical Engineers.
Richardson Engineering Co., Hartford, Conn.

Contracting Electrical Engineers.
Dennis G. Brussel, 15 W. 29th St., N. Y. C.
Richardson Engineering Co., Hartford, Conn.

Copper Work.
John Trageser Steam Copper Works, 447 W. 26th St., N. Y. C.

Corner Bead.
Hunt Metal Corner Co., Westboro, Mass.

Dampers.
Sharpless & Watts Company, 1522 Sansom St., Philadelphia.

Decorators.
Architectural Decorating Co., 643 S. Jefferson St., Chicago.
Daprato Statuary Co., 173 W. Adams St., Chicago; 31 Barclay St., N. Y. C.
W. P. Nelson Co., New York, Chicago, Baltimore.
Phillips & Jullien, 156 Fifth Ave., N. Y. C.

Doors.
E. J. Davis Mfg. Co., Chicago, Ill.
Morgan Co., Oshkosh, Wis.

Doors, Automatic Fire.
Allith Manufacturing Co., Chicago.

Doors, Revolving.
Van Kannel Revolving Door Co., 524 East 134th St., N. Y. C.

Door Hangers.
T. C. Prouty Co., Ltd., Albion, Mich.
Reliance Ball Bearing Door Hanger Co., 1 Madison Ave., N. Y. C.
Richards Mfg. Co., Aurora, Ill.

Door Holder.
Caldwell Mfg. Co., 40 Jones St., Rochester, N. Y.

Drawing Inks.
Charles M. Higgins Co., Main Office, 271 9th St., Brooklyn, N. Y.

Drawing Paper.
Mittineague Paper Co., Mittineague, Mass.

Dumb-Waiters.
James Murtaugh Co., 202-204 E. 42d St., N.Y.C.
Sedgwick Machine Works, 128 Liberty St., N.Y.C.
Storm Manufacturing Co., Newark, N. J.

Dynamos.
Northern Electrical Mfg. Co., Madison, Wis.

Electrical Engineers.
Dennis G. Brussel, 15 W. 29th St., N. Y. C.
Kohler Bros., 1804-12 Fisher Bldg., Chicago.
Richardson Engineering Co., Hartford, Conn.

Electrical Equipment.
Dennis G. Brussel, 15 West 29th St., N. Y. C.
W. Green Electric Co., 81 Nassau St., N. Y. C.
Kohler Bros., 1804-12 Fisher Bldg., Chicago.
Northern Electrical Mfg. Co., Madison, Wis.
Richardson Engineering Co., Hartford, Conn.
Thompson-Starrett Co., 51 Wall St., N. Y. C.
Western Wire Sales Co., 324 Dearborn St., Chicago, Ill.

Electric Clocks.
Magneta Co., 120-122 W. 31st St., N. Y. C.

Electric Lighting Equipment.
Northern Electrical Mfg. Co., Madison, Wis.
Richardson Engineering Co., Hartford, Conn.

Electric Wires and Cables.
Western Wire Sales Co., 324 Dearborn St., Chicago, Ill.

Elevators.
Bethlehem Foundry & Machine Co., So Bethlehem, Pa.
Otis Elevator Co., 17 Battery Pl., N. Y. C.

Elevators, Hand Power.
Storm Manufacturing Co., Newark, N. J.

Enamel Paint.
J. L. Mitchell Paint Co., 1 Madison Ave., N.Y.C.
Rinald Bros., 1142 North Hancock St., Philadelphia, Pa.
Thomson Wood Finishing Co., Philadelphia.

Enameled Brick.
Sayre & Fisher Co., 207 B'way, N. Y. C.
Tiffany Enameled Brick Co., Momence, Ill.

Engineers and Contractors.
American Bridge Co., 100 B'way, N. Y. C.; Frick Bldg., Pittsburg, Pa.; Monadnock Block, Chicago.
Geo. Mertz's Sons, Port Chester, N. Y.
The Foundation Co., 35 Nassau St., N. Y. C.
Tucker & Vinton, 156 5th Ave., N. Y.
Thompson-Starrett Co., 51 Wall St., N. Y. C.
A. & S. Wilson Co., Pittsburg, Pa.

Expanded Metal.
Associated Expanded Metal Companies, 227 5th Ave., N. Y. C.
Garry Iron & Steel Co., Cleveland, Ohio.
General Fireproofing Co., Youngstown, O.

Exterior Wall Cleaning.
National Waterproofing & Cleaning Co., 42 East 23d St., N. Y. C.

Exterior Wall Damp Proofing.
National Waterproofing & Cleaning Co., 42 East 23d St., N. Y. C.

Faience.
Hartford Faience Co., Hartford, Conn.

Filters.
Loomis-Manning Filter Co., Land Title Bldg., Philadelphia, Pa.

Fire Extinguishers.
E. B. Badger & Sons Co., Boston, Mass.

Fireplace Fixtures.
Edwin A. Jackson & Bro., 49 Beekman St., N. Y. C.
W. H. Jackson Co., 29 E. 17th St., N. Y. C.

Fireproof Doors and Shutters.
Thorp Fireproof Door Co., Minneapolis, Minn.
Kinnear Mfg. Co., Columbus, O.
John W. Rapp, 1 Madison Ave., N. Y. C.

Fireproof Furniture.
General Fireproofing Co., Youngstown, O.

Fireproof Paint.
M. Ewing Fox & Co., 136th St. and Rider Ave., New York and Chicago.

Fireproof Safes.
York Safe & Lock Co., 70 Maiden Lane, N.Y.C.

Fireproof Windows.
American Luxfer Prism Co., Chicago; N. Y. Office, 160 5th Ave.; Boston, Mass.
E. B. Badger & Sons Co., Boston, Mass.
James A. Miller & Bro., 131 So. Clinton St., Chicago.
W. H. Mullins Co., Salem, Ohio.
John W. Rapp, 1 Madison Ave., N. Y. C.
Voigtmann & Co., Chicago and New York.

Fireproofing.
Clinton Wire Cloth Co., Chicago; San Francisco, Cal.; Clinton, Mass.; N. Y. Offices, 33 Park Pl. and 150 Nassau St.
Columbian Reinforced Concrete Co., 26 W. 26th St., N. Y. C.; Times Bldg., Pittsburg, Pa.
Thorp Fireproof Door Co., Minneapolis, Minn.
General Fireproofing Co., Youngstown, O.
Hecla Iron Works, N. 11th and Berry Sts., Brooklyn, N. Y.
O. W. Ketcham, 24 South 7th St., Philadelphia.
National Fireproofing Co., Bessemer Bldg., Pittsburg, Pa.
Roebling Construction Co., Fuller Bldg., N.Y.C.
White Fireproof Construction Co., 1 Madison Ave., N. Y. C.

Floor and Wood-Work Polish.
Butcher Polish Co., 356 Atlantic Ave., Boston Mass.

Foundations.
The Foundation Co., 35 Nassau St., N. Y. C.

Furnaces and Ranges.
Chappell Furnace Co., Morenci, Mich.
Kelsey Heating Co., Syracuse, N. Y.; 156 5th Ave., N. Y. C.
Thatcher Furnace Co., 110 Beekman St., N.Y.C.

Gas and Electric Fixtures.
Holophane Co., 227 Fulton St., N. Y. C.

Gas and Gasoline Engines.
National Meter Co., 84-86 Chambers St., N.Y.C.; Chicago and Boston.
Temple Pump Co., Meagher and 15th Sts., Chicago.

Glass.
Pittsburgh Plate Glass Co., Frick Bldg., Pittsburgh; 1135 Broadway, N. Y. C.

Glass Doors and Partitions.
Pressed Prism Plate Glass Co., Morgantown, W. Va.

Glass Tile.
Federal Tile Co., 131 W. 24th St., N. Y. C.

Globes for Gas and Electric Lights.
Holophane Co., 227 Fulton St., N. Y. C.

Granite.
Perry-Tyrie-Alger Co., 1 Madison Ave., N. Y. C.

Graphite Paint.
Detroit Graphite Mfg. Co., New York, Boston, Chicago, Buffalo, St. Louis, Detroit.

Greenhouses.
Lord & Burnham Co., 1133 Broadway, N. Y. C.
Pierson U-Bar Co., 4th Ave. and 23d St., N.Y.C.
A. T. Stearns Lumber Co., Neponset, Boston, Mass.

Gutters (Wood).
A. T. Stearns Lumber Co., Neponset, Boston, Mass.

Hardware.
Bayer-Gardner-Himes Co., 159 West 29th St., N. Y. C.
Bommer Bros., Brooklyn, N. Y.
Chicago Spring Butt Co., Chicago and N. Y. C.
Clift Co., Cleveland, Ohio.
Columbian Hardware Co.; Main Office, Cleveland, Ohio; 168 Church St., N. Y. C.; 26 E. Lake St., Chicago.
Grant Pulley & Hardware Co., 35 Warren St., N. Y. C.
Richards Mfg. Co., Aurora, Ill.
Russell & Erwin Mfg. Co., New Britain, Conn.; N. Y. Office, 26 W. 26th St.; Chicago, Philadelphia and San Francisco.
Shelby Spring Hinge Co., Shelby, Ohio.
Stanley Works, New Britain, Conn.; N. Y. Office, 79 Chambers St.

Hardwood Floors.
Wood-Mosaic Flooring Co., Rochester, N. Y.

Heat Regulation.
Honeywell Heating Specialty Co., Wabash, Ind.
Powers Regulator Co., 40 Dearborn St., Chicago; 111 Fifth Ave., N. Y. C.
Thermograde Valve Co., 294 Washington St., Boston.

Heating Apparatus.
American Radiator Co., Chicago.
Gurney Heater Mfg. Co., Boston, Mass.
Honeywell Heating Specialty Co., Wabash, Ind.
Kelsey Heating Co., Syracuse, N. Y.; 156 5th Ave., N. Y. C.
Pierce, Butler & Pierce Mfg. Co., Syracuse, New York, Boston and Philadelphia.
Perfection Furnace Pipe Co., Toledo, Ohio.
Schott Specialty Co., Chicago, Ill.
Thatcher Furnace Co., 110 Beekman St., N.Y.C.
Thermograde Valve Co., Old South Bldg., Boston, Mass.
Warren Webster & Co., Camden, N. J.

Hinges and Butts.
Bommer Bros., Brooklyn, N. Y.
Chicago Spring Butt Co., Chicago and N. Y. C.

Hooks-Folding, for Garments.
Clift Co., 212 Cuyahoga Bldg., Cleveland, Ohio.

Hose (Fire).
Eureka Fire Hose Co., 13 Barclay St., N. Y. C.

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E. J. Winslow Co., 138 Jackson Boulevard, Chicago.

Insulators (Heat and Cold).
Union Fibre Co., Minneapolis, Minn.

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H. A. Schweyer, King of Prussia, Mont. Co., Pa.

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Geo. Mertz's Sons, Port Chester, N. Y.
Morgan Co., Oshkosh, Wis.
A. T. Stearns Lumber Co., Neponset, Boston, Mass.

Invalid Lifts.
Storm Manufacturing Co., Newark, N. J.

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L. Canziani, 154 W. 27th St., N. Y. C.
Thomas Dimond, 128 West 33d St., N. Y. C.
General Fireproofing Co., Youngstown, O.
Gorham Company, New York.
Hecla Iron Works, N. 11th and Berry Sts., Brooklyn, N. Y.
W. H. Mullins Co., Salem, Ohio.
Jno. Williams, Inc., 556 W. 27th St., N. Y. C.
Winslow Bros. Co., Chicago; N. Y. Office, 160 5th Ave.

Joist Hangers.
Hercules Steel & Iron Co., Cleveland, Ohio.

Iron Sheets and Tin Plate.
Meurer Bros. Co., Brooklyn, N. Y.

Kalsomine.
M. Ewing Fox & Co., 136th st. and Rider Ave., N. Y. C.; 53-55 E. Lake St., Chicago.
Muralo Co., New Brighton, N. Y.

Lath—(Metal).
Garry Iron and Steel Co., Cleveland, Ohio.

Laundry Machinery.
American Laundry Machinery Co., Cincinnati, O.; N. Y. Office, 42 Cortlandt St.
Northern Electrical Mfg. Co., Madison, Wis.

Lighting Fixtures.
Duffner and Kimberly Co., 11 West 32d St., N. Y. C.
I. P. Frink, 551 Pearl St., N. Y. C.
Holophane Co., 227 Fulton St., N. Y. C.

Lighting and Power Plants.
Dennis G. Brussel, 15 W. 29th St., N. Y. C.
Northern Electrical Mfg. Co., Madison, Wis.
Richardson Engineering Co., Hartford, Conn.

Limestone.
Bedford Quarries Co., Chicago, Ill.

Lockers (Metal).
Merritt & Co., 1007 Ridge Ave., Philadelphia.

Mahogany (East India).
I. T. Williams & Sons, 11th Ave. and 25th St., N. Y. C.

Mail Chutes.
Cutler Mfg. Co., Cutler Bldgs., Rochester, N. Y.

Mantels.
Edwin A. Jackson & Bro., 49 Beekman St., N. Y. C.
Hartford Faience Co., Hartford, Conn.
W. H. Jackson Co., 29 E. 17th St., N. Y. C.; Foundry and Shops, 229-239 W. 28th St.
Wollaeger Mfg. Co., Milwaukee, Wis., and Pittsburg, Pa.

Marble.
Bowker, Torrey Co., 118 Portland, cor. Chardon and Bowker Sts., Boston, Mass.
Daprato Statuary Co., 173 W. Adams St., Chicago; 31 Barclay St., N. Y. C.
Grant Marble Co., Milwaukee, Wis.
P. M. & W. Schlichter, 624-626 W. 47th St., N. Y. C.
Henry A. Schweyer, King of Prussia, Montgomery Co., Pa.
John H. Shipway & Bro., 136th St. and East River, N. Y. C.

Marble (Artificial).
Mycenian Marble Co., 524 and 526 W. 34th St., N. Y. C.

Medicine Closets.
Sharpless & Watts Company, 1522 Sansom St., Philadelphia.

Metal Corner.
Hunt Metal Corner Co., Westboro, Mass.

Metal-Covered Doors and Trim.
Thorp Fireproof Door Co., Minneapolis, Minn.
John W. Rapp, 1 Madison Ave., N. Y. C.

Metal Furniture.
General Fireproofing Co., Youngstown, O.

Metal Lath.
Associated Expanded Metal Companies, 227 5th Ave., N. Y. C.
Columbian Reinforced Concrete Co., 26 W. 26th St., N. Y. C.; Times Bldg., Pittsburg, Pa.
Garry Iron and Steel Co., Cleveland, Ohio.
General Fireproofing Co., Youngstown, O.
White Fireproof Construction Co., 1 Madison Ave., N. Y. C.

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Mosaic Wood Floors.
Wood-Mosaic Flooring Co., Rochester, N. Y.

Mosaic Workers.
Daprato Statuary Co., 173 W. Adams St., Chicago; 31 Barclay St., N. Y. C.
Federal Tile Co., 131 W. 24th St., N. Y. C.
John H. Shipway & Bro., 136th St. and East River, N. Y. C.

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Kohler Bros., 1804-12 Fisher Bldg., Chicago.
Northern Electrical Mfg Co., Madison, Wis.

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Thomas Dimond, 128 West 33d St., N. Y. C.
Lasar-Letzig Mfg. Co., St. Louis, Mo.
Winslow Bros. Co., Chicago; N. Y. Office, 160 5th Ave.

Paints.
J. A. & W. Bird & Co., 31 Union Sq. West, N. Y. C.
Bridgeport Wood-Finishing Co., 55 Fulton St., N. Y. C.; New Milford, Conn.; Philadelphia; Chicago.
Detroit Graphite Mfg. Co., Detroit, Mich.; New York, Boston, Chicago, Buffalo, Cleveland.
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J. L. Mitchell Paint Co., 1 Madison Ave., N.Y.C.
Muralo Co., New Brighton, N. Y.
National Lead Co., 100 William St., N. Y. C.
Rinald Bros., 1142 N. Hancock St., Philadelphia.

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Emmel Co., 81 Bristol St., Boston, Mass.

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T. C. Prouty Co., Ltd., Albion, Mich.

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Wood-Mosaic Flooring Co., Rochester, N. Y.

Pianos (Special Cases to Order).
Chickering & Sons, Boston, Mass.
Steinway & Sons, 107 East 14th St., N. Y. C.

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Corrugated Concrete Pile Co., 1170 B'way, N.Y.C
Raymond Concrete Pile Co., 135 Adams St., Chicago.

Plaster Board.
Sackett Plaster Board Co., New York City.

Plumbing Fixtures.
Cahill Iron Works, Chattanooga, Tenn.
Standard Sanitary Mfg. Co., Pittsburg, Pa.
John Trageser Steam Copper Works, 447 W. 26th St., N. Y. C.
Union Brass Works Co., 7 Sherman St., Boston, Mass.
L. Wolff Mfg. Co., Chicago.

Pneumatic Water Supply.
Kewanee Water Supply Co., Kewanee, Ill.

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Butcher Polish Co., 356 Atlantic Ave., Boston, Mass.

Porcelain Enameled Baths.
Cahill Iron Works, Chattanooga, Tenn.
Standard Sanitary Mfg. Co., Pittsburg, Pa.
L. Wolff Mfg. Co., Chicago.

Porcelain Enamel Paint.
Rinald Bros., 1142-1146 N. Hancock St., Philadelphia, Pa.

Porcelite Enamel Paint.
Thomson Wood Finishing Co., Philadelphia.

Post Caps.
Hercules Steel & Iron Co., Cleveland, Ohio.

Prism Lighting.
American Luxfer Prism Co., Heyworth Bldg., Chicago.
American 3-Way Prism Co., 1718 Land Title Bldg., Philadelphia.
Pressed Prism Plate Glass Co., Morgantown, W. Va.

Radiators.
American Radiator Co., Chicago.
Kellogg-Mackay-Cameron Co., Lake and Franklin Sts., Chicago.
Pressed Radiator Co., 41 E. 21st St., N. Y. C.
United States Radiator Co., Dunkirk, N. Y.

Radiator Valves.
Monash-Younker Co., 203 S. Canal St., Chicago; 88 Centre St., N. Y. C.

Red Lead.
National Lead Co., 100 William St., N. Y. C.

Reflectors.
I. P. Frink, 551 Pearl St., N. Y. C.
Holophane Co., 227 Fulton St., N. Y. C.

Refrigerators.
McCray Refrigerator Co., Kendallville, Ind.

Regulation, Heat.
Powers Regulator Co., 40 Dearborn St., Chicago; 111 Fifth Ave., N. Y. C.
Thermograde Valve Co., 294 Washington St., Boston.

Roofing.
Barrett Mfg. Co., 17 Battery Pl., N. Y. C.

Roofing Slate.
Genuine Bangor Slate Co., Easton, Pa.

Roofing Tiles.
O. W. Ketcham, Bldrs. Exchange, Philadelphia.
National Roofing Tile Co., Lima, O.

Roofing Tin.
American Sheet & Tin Plate Co., Pittsburg, Pa.
N. & G. Taylor Co., Chestnut and 3d Sts., Philadelphia, Pa.; N. Y. Office, 1123 Broadway.
Nat. Assn. Master Sheet Metal Workers.

Rugs.
Persian Rug Manufactory, 894 Broadway, N.Y.C.

Safes.
York Safe & Lock Co., 55 Maiden Lane, N.Y.C.

Safety Furnace Pipe.
Perfection Furnace Pipe Co., Toledo, Ohio.

Sand Blasting.
National Waterproofing & Cleaning Co., 42 East 23d St., N. Y. C.

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Cahill Iron Works, Chattanooga, Tenn.
Glauber Brass Mfg. Co., Cleveland, O.
Never-Split Seat Co., Evansville, Ind.
Pierce, Butler & Pierce Mfg. Co., Syracuse, New York, Boston and Philadelphia.
Standard Sanitary Mfg. Co., Pittsburg, Pa.
John Trageser Steam Copper Works, 447 W 26th St., N. Y. C.
Trenton Potteries Co., Trenton, N. J.
Union Brass Works Co., 7 Sherman St., Boston, Mass.
L. Wolff Mfg. Co., Chicago, Ill.

Sanitary Pottery.
Trenton Potteries Co., Trenton, N. J.

Sash.
Morgan Co., Oshkosh, Wis.

Sash Chain.
Bridgeport Chain Co., Bridgeport, Conn.
Smith & Egge Mfg. Co., Bridgeport, Conn.

Sash Cord.
Samson Cordage Works, Boston, Mass.
Silver Lake Co., Boston, Mass.

Sash Pulleys.
Grant Pulley & Hardware Co., 35 Warren St., N. Y. C.

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House Sewage Disposal Co., Chicago, Ill.
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Sewer Trap.
W. J. Scully Ventilator & Mfg. Co., Detroit, Mich.

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Harry C. Knisely Co., 273 S. Canal St., Chicago.
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Sheet Metal Work.
Burt Mfg. Co., Akron, Ohio.
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Shelving, Metal.
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Samuel Cabot, 141 Milk St., Boston, Mass.
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Pressed Prism Plate Glass Co., Morgantown, W. Va.

Skylights.
Burt Mfg. Co., Akron, Ohio.

Slate Roofs.
Genuine Bangor Slate Co., Easton, Pa.

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Folsom Snow Guard Co., Boston, Mass.

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Kelsey Heating Co., Syracuse, N. Y.; 156 5th Ave., N. Y. C.
Monash-Younker Co., 203 S. Canal St., Chicago; 88 Centre St., N. Y. C.
Norwall Mfg. Co., 154 Lake St., Chicago; 104 W. 42d St., N. Y. C.
Pierce, Butler & Pierce Mfg. Co., Syracuse, New York, Boston and Philadelphia.
Thatcher Furnace Co., 110 Beekman St., N.Y.C.
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General Fireproofing Co., Youngstown, O.

Steel Rolling Doors and Shutters.
Kinnear Mfg. Co., Columbus, O.

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Pittsburgh Plate Glass Co., Frick Bldg., Pittsburgh; 1135 Broadway, N. Y. C.

Structural Iron and Steel.
American Bridge Co., 100 B'way, N. Y. C.; Frick Bldg., Pittsburg, Pa.; Monadnock Block, Chicago.
Thompson-Starrett Co., 51 Wall St., N. Y. C.

Temperature Regulation.
Powers Regulator Co., 111 5th Ave., N. Y. C.; 40 Dearborn St., Chicago.

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O. W. Ketcham, 24 South 7th St., Philadelphia.
National Fireproofing Co., Hartford Bldg., Chicago, Ill.
Northwestern Terra Cotta Co., 1000 Clybourn Ave., Chicago, Ill.

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I. P. Frink, 551 Pearl St., N. Y. C.
Holophane Co., 227 Fulton St., N. Y. C.

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Bobbink & Atkins, Rutherford, N. J.

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Kellogg-Mackay-Cameron Co., Lake and Franklin Sts., Chicago.
Norwall Mfg. Co., 154 Lake St., Chicago; 104 W. 42d St., N. Y. C.

Valves.
Jenkins Bros., New York, Boston, Philadelphia, Chicago and London.
Monash-Younker Co., 203 S. Canal St., Chicago; 88 Centre St., N. Y. C.
Thermograde Valve Co., Old South Bldg., Boston, Mass.
Union Brass Works Co., 7 Sherman St., Boston, Mass.

Varnish.
Thomson Wood Finishing Co., Philadelphia.

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York Safe & Lock Co., 55 Maiden Lane, N.Y.C.

Vault Lights.
American Luxfer Prism Co., Chicago.
American 3-Way Prism Co., 1718 Land Title Bldg., Philadelphia.

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Muralo Co., New Brighton, N. Y.

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Sackett Plaster Board Co., New York City.

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Leatherole Co., 24 East 22d St., N. Y. C.

Water Filters.
Loomis-Manning Filter Co., Land Title Bldg., Philadelphia, Pa.

Water Heaters.
American Heater Mfg. Co., West Chicago, Ill.
Humphrey Co., 538 Rose St., Kalamazoo, Mich.
Kelsey Heating Co., Syracuse, N. Y.; 156 5th Ave., N. Y. C.
Norwall Mfg. Co., 154 Lake St., Chicago; 104 W. 42d St., N. Y. C.
Thatcher Furnace Co., 110 Beekman St., N.Y.C.
John Wood Mfg. Co., Conshohocken, Pa.

Water Meters.
National Meter Co., 84-86 Chambers St., N.Y.C.; Chicago and Boston.

Waterproof Paints.
Detroit Graphite Mfg. Co., New York, Boston, Chicago, Buffalo, Cleveland, Detroit.

Waterproofing.
National Waterproofing & Cleaning Co., 42 East 23d St., N. Y. C.

Waterproof Compound.
Sandusky Portland Cement Co., Sandusky, O.

Waterproofing (Paraffine).
National Waterproofing & Cleaning Co., 42 East 23d St., N. Y. C.

Water Supply.
Kewanee Water Supply Co., Kewanee, Ill.

Wax Finish (for Interior Woodwork).
Butcher Polish Co., 356 Atlantic Ave., Boston, Mass.

Welded Fabric.
Clinton Wire Cloth Co., Chicago; San Francisco; Clinton, Mass.; N. Y. Offices, 33 Park Pl., 150 Nassau St.

White Lead.
W. J. Matheson & Co., Ltd., N. Y. C.
National Lead Co., 100 William St., N. Y. C.

Windows (Prism).
American Luxfer Prism Co., 160 5th Ave., N. Y. C.

Windows (Memorial).
Church Glass & Decorating Co., 28 West 30th St., N. Y. C.

Window Corner Posts.
Detroit Show Case Co., 477 West Fort St., Detroit, Mich.

Window Screens.
Higgin Mfg. Co., Newport, Ky.

Window Shade Adjusters.
C. I. Wimmer & Co., Columbus, O.

Wire Glass Windows.
Jas. A. Miller & Bro., 131 So. Clinton St., Chicago.

Wire Lath.
Clinton Wire Cloth Co.; N. Y. Offices, 33 Park Pl., 150 Nassau St.; Boston; Chicago; San Francisco; Clinton, Mass.

Wiring (Electric).
Kohler Bros., 1804-12 Fisher Bldg., Chicago.
Northern Electrical Mfg. Co., Madison, Wis.

Wood Carving.
Emmel Co., 81 Bristol St., Boston, Mass.
Wollaeger Mfg. Co., Milwaukee, Wis., and Pittsburg, Pa.

Wood Filler.
Bridgeport Wood Finishing Co., New Milford, Conn.; 55 Fulton St., N. Y. C.

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Samuel Cabot, 141 Milk St., Boston, Mass.

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General Contractors and Builders of Fine Country Residential Work, also Manufacturers of High Grade Interior Cabinet Work

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PEERLESS RUBBER TILING

The most durable and economical floor covering made.
Beautiful Designs. Effective Colorings.
Noiseless, Waterproof and Nonabsorbent.

Peerless Rubber Tiling is made in large sheets, and consequently does not have innumerable crevices through which dirt and liquids can enter. It is therefore the only perfectly sanitary Rubber floor covering on the market.

Beware of hard, brick-like substances purporting to be rubber tiling.

The Peerless Tiling is soft and elastic and is made from pure rubber.

Send for our booklet and prices.

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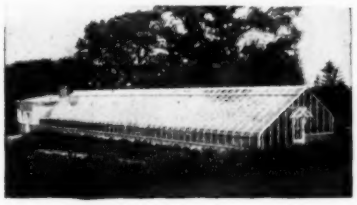
PEERLESS RUBBER MFG. CO., 16 Warren St., NEW YORK



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There is not the least bit of affectation about U-BAR greenhouses—they are "Sunshine Shops" from start to finish. Perhaps it's their very simplicity, frank avowal of purpose and general attractiveness that make them appeal so strongly.

They are the only houses built with curved eaves, wide glass spacing and having a glistening aluminum interior finish.

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Designers and Builders

U-BAR GREENHOUSES

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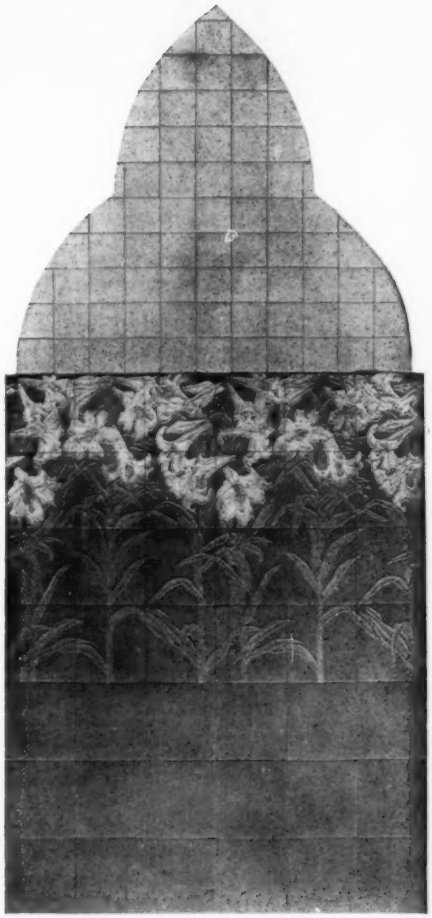

AN ecclesiastical detail of Reredos in Trinity Church, Columbus, O., F. L. Packard, Architect, designed and executed in Mat Glaze Faience Tiles at the Rookwood Pottery.

This material is peculiarly adapted to producing effects of great richness and beauty, combined with absolute permanence, at a reasonable cost.

The Rookwood Pottery Co.

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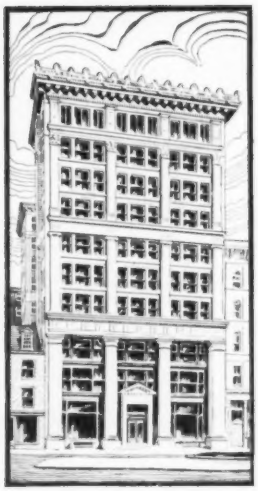

Munsey Building, Washington, D. C. McKim, Mead & White, Architects.

Here follows a list of important jobs, together with names of their respective architects:

NEW YORK — Theatres: New Amsterdam Thea. and Bldg., Lyceum, Liberty, Lyric, New York, etc. Clubs: Engineers and New York Club Bldgs. Office Buildings: Trin. ', Woodbridge, Hudson Realty, United Engineering, Day and Night Bank and Bldg., Butler, Babbitt, McCall, etc. Public Buildings: Manhattan and Fordham Hospitals, Seventy-first Regiment Armory, St. Joseph Normal College, Breslin Hotel, Brooklyn Commercial High School, D., L. & W. Ferry and Terminal Station, Staten Island Terminal, Browning-King Bldg., etc.

BALTIMORE — Banks: Union Trust, Farmers' and Merchants', and Continental Bank and Bldg. Office Bldgs.: Baltimore American, Equitable, Calvert, Ingram, Maryland Life, Maryland Trust, Maryland Casualty, and many others. Hotels: Belvidere Hotel.

CHICAGO—Hotels: Auditorium Hotel and Annex, Lexington, and Grand Pacific Hotels. Banks: Northern Trust Company Bank, First National Bank Bldg., Chicago Savings Bank Bldg., and many others. Theatres: Whitney, Iroquois, Powers, Studebaker, Garrick, New, International, and others. Clubs: South Shore Country Club, Union League, Kenwood, and others. Office Bldgs.: Monadnock, Fisher, Nechter, Fine Arts, Marshall Field & Company, Schlesinger & Mayer, Marquette, C. & N. W. R. R. office bldg., and many others. Depots: Illinois Central and Grand Central.

A Painting Service

It is probable that in no other line of building contracting are there so many contractors or does one firm do so large a part of the important work in its line as in painting and wood-finishing.

Naturally, it is not because this one firm is always the lowest bidder, for there are important equations other than price entering into the awarding of the painting and wood-finishing contract.

An organization with offices in New York and Chicago, which has reached the stage of development where it is now delivering a **painting and wood-finishing service** unique in its resources and its performances, is at least interesting to architects and general contractors.

Some of the apparent savings and increased service that such an organization can practically offer are here noted:

In Point of Time

We are able repeatedly to take time contracts of the largest magnitude with delivery conditions which the "average contractor" would call "impossible." Such contracts are not exceptions, but are conditions being met in widely scattered parts of the country, and not only a large but a most elastic organization is necessary to meet these situations.

In Class of Workmanship

With a business of this scope we can safely carry specialists in various lines the year around; specialists whom the "average contractor" must do his best to pick up **after he signs the contract.**

It is not hard to imagine which policy gets and retains the highest type of artisans. It is largely this power of selection that has built up this organization and its resulting service.

W. P. NELSON COMPANY

NEW YORK CHICAGO

A Painting Service

In Purchasing Materials

The bulk of buying generally determines the price paid. Our purchasing department is as carefully organized as that of any manufacturing corporation. We buy from first hands and **we know what we buy.** We maintain our own laboratories for the testing of all material. Our protection against inferior material is not even thought of by the "average contractor." We constantly reject material that to the eye "looks all right."

The Guarantee Against Substitution

The architect's best protection against the use of inferior varnishes and paints in place of specified brands is the fact that the self protection of our whole organization and business system precludes underhand work of this kind being successfully and economically carried out.

We want to meet architects and general contractors who have large work—peculiar working conditions—time contracts on painting and wood-finishing. *Often* we can save money, but *always* we deliver a service that is distinctly different from that of the "average contractor."

A competent man will call anywhere in this country for consultation or estimating upon request.

List of Important Jobs (continued)

PITTSBURG — Nixon Thea. and Bldg., Philadelphia, Ambridge, Carnegie Technical Schools, and other large bldgs. Exposition Bldgs.: Jamestown, St. Louis, and Chicago. State Capitol Bldgs.: Virginia State and Mississippi State Capitol Bldgs.

We take pleasure in referring to the following prominent architects and general contractors

NEW YORK—Parker & Thomas, Francis H. Kimball, H. J. Hardenbergh, Hale & Rogers, Carrere & Hastings, K. M. Murchison, Israel & Harder, Palmer & Hornbostel and other leading architects throughout the country.

CHICAGO—D. H. Burnham & Co., Holabird & Roche, Frost & Granger, Shepley, Rutan & Coolidge, S. S. Beman, H. R. Wilson, Benj. Marshall, Egan & Prindeville.

ST. LOUIS—Isaac Taylor, Albert Swazey.

GENERAL CONTRACTORS—Wells Bros. Co., Geo. A. Fuller Construction Co., Thompson-Starrett Co., W. M. Grace Co., Murphy Construction Co., Snare & Triest, Fleischmann Construction Co., and other leading builders and construction companies throughout the country.

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Clinton & Russell, Architects
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To protect these architects from any misinterpretation of these closed specifications, the price of Bedford Stone from the "Old Hoosier" Quarry has been made absolutely non-fluctuating, and this price is public property.

Business which we get on closed specifications ("Stone from the Old Hoosier Quarry only") and business coming to us because ours is the

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With this policy back of him the architect may feel entirely safe in securing for his client the only uniformly high grade Bedford Stone obtainable by writing his specifications, "Stone from the Old Hoosier Quarry of the Bedford Quarries Company."

Write the nearest office for standard prices, samples or for other information on this close grained, even colored, easily carved and thoroughly sound weatherproof stone from the "OLD HOOSIER Quarry."

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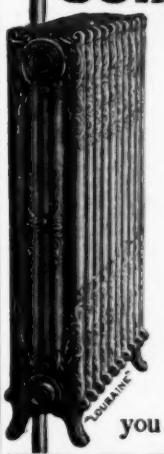
AMERICAN TRUST BLDG.
CHICAGO

Comfortable Heating



If you could regulate the rays of the sun and store up the life-giving warmth of a balmy spring day; if you could do this with Ease, Comfort and Economy, and have perfect control of the apparatus, you could not improve upon

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OF STEAM AND HOT WATER HEATING

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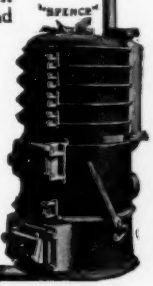
Over 300 styles and sizes to meet every requirement; nearly 200,000 in use. Thousands have been giving satisfaction for the **past thirty years.** Sold through local dealers everywhere. *"Pierce Quality"*

SANITARY PLUMBING

goods in Porcelain Enamel and Solid Vitreous Ware are ideal equipments for Bath, Laundry and Kitchen. "It pays to procure both heating and plumbing goods from the same manufacturer."



Send for "Common Sense Heating and Sanitary Plumbing," a most practical and interesting book. It is free. The name of your Architect, Steamfitter and Plumber would be appreciated.

PIERCE, BUTLER & PIERCE MANUFACTURING CO.
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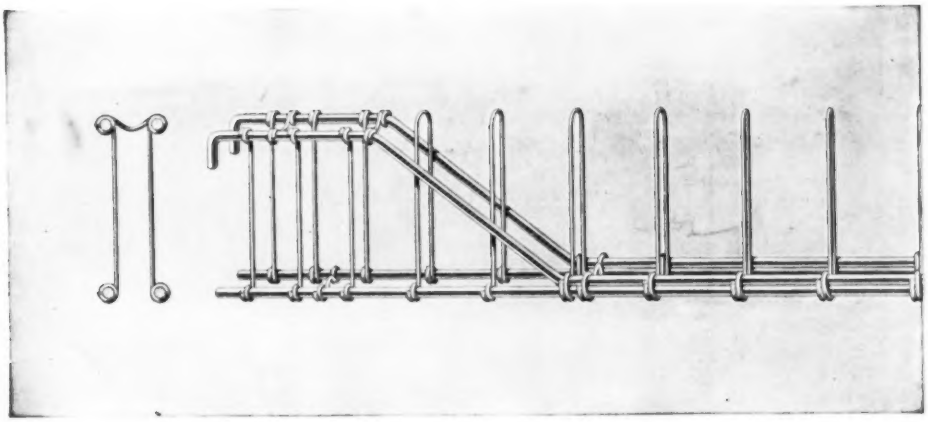
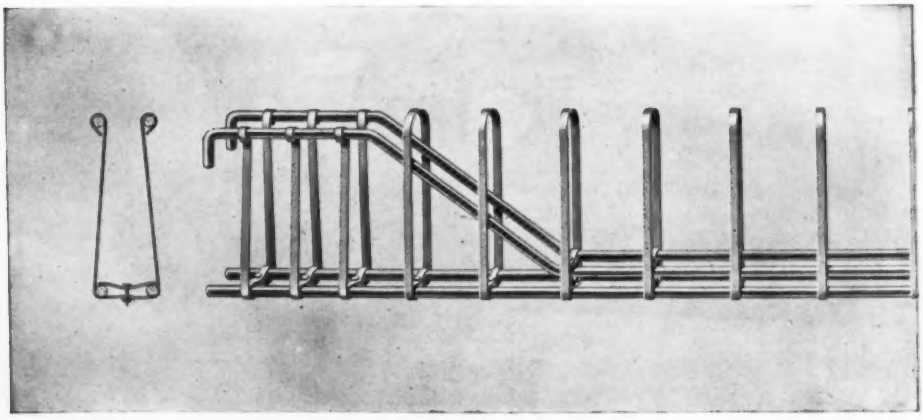
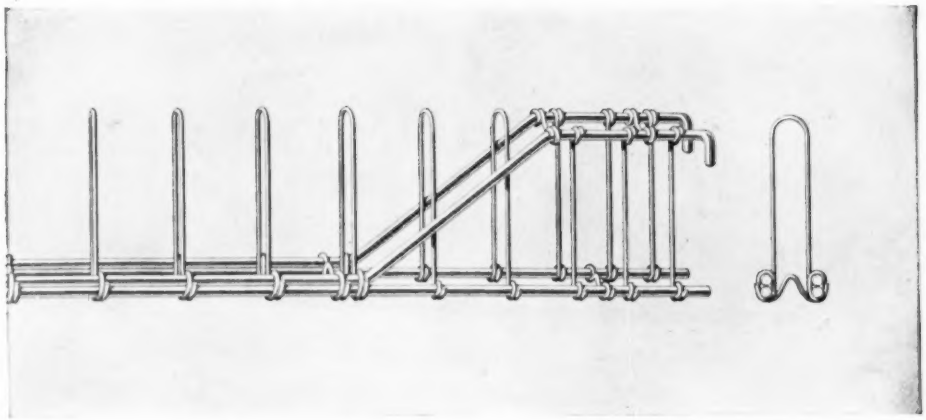
The Tucker & Vinton Unit



UNDER our Unit System of Concrete Reinforcement we substitute accuracy for guesswork, safety for danger. ¶ The old loose rod system is unsafe, inaccurate, clumsy and dangerous. ¶ It was a makeshift adopted to meet the requirements of a new industry. ¶ It is just as foolish to reinforce a concrete building with loose rods assembled on the job as it would be to frame a steel building with loose sections cut and fitted and riveted together on a job. ¶ Under the Unit System the reinforcements for the entire building are designed to meet the exact requirements in each case. ¶ Then they are fabricated in our nearest shop and shipped to the job in Units. ¶ Each Unit is tagged and each shipment is accompanied by a blue print showing where it belongs. ¶ It has got to go there, for it won't fit anywhere else. ¶ The saving of time and labor on the job in placing the reinforcement more than offsets the



System of Reinforcement [Patented]



cost of fabrication, so that a Unit building is not only a safer building, but a cheaper building. ¶ Type A, shown in the upper illustration, is fabricated by the hot shrunk process. ¶ Type B, shown below, is fabricated by bolting the members together. ¶ Each type meets particular requirements. ¶ Both meet all the requirements of a safe and sane reinforcing system.

¶ Write at once for our new catalog, now in the printer's hands, describing the Unit System and a few of the 150 buildings in which it has been used.

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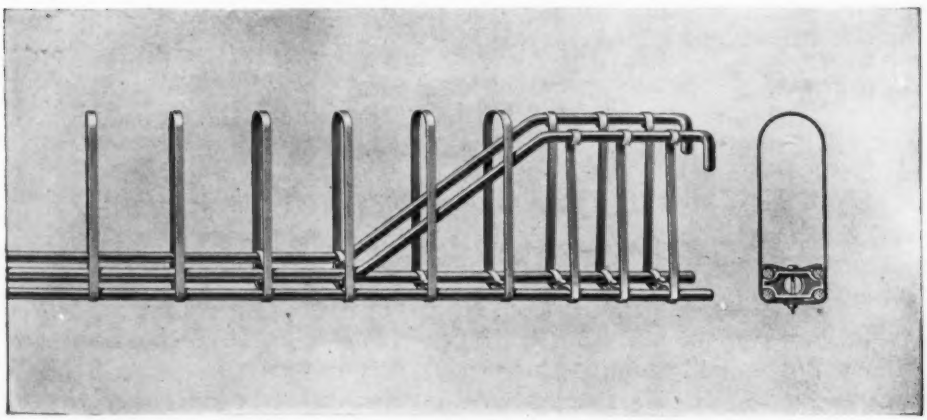
NEW YORK

NEW ENGLAND LICENSEE
W. F. KEARNS COMPANY
161 Devonshire Street
BOSTON, MASS.

CHICAGO LICENSEE
Unit Concrete Steel Company
42 Madison Street
CHICAGO, ILL.



The Foundation Company

New Orleans, La. NEW YORK, N. Y. 115 Broadway Kansas City, Mo.

NEW YORK IN 1855 AND

OBSERVE the vast improvement in the class, size and height of the BUILDINGS in lower New York. This great change in the SKYLINE and general appearance of lower Manhattan has been brought about within the last 15 years.

BEDROCK below Fulton Street, New York, is found at a depth of from 50 to 95 feet beneath the general street level. Most of this depth is of water-bearing material, and it is necessary to go through it to reach rock or hardpan.

¶ **BEDROCK or good hardpan is the only proper footing for a heavy SKYSCRAPER**

"Difficult work has been successfully accomplished by the men who constitute THE FOUNDATION COMPANY. Their engineering ability and special equipment have made the SKYSCRAPER in lower New York a practical and commercial possibility."

The Foundation Company

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NEW YORK OF 1908

The above skyline represents New York as it will appear when the Forty-one Story Singer Building is completed.

THE FOUNDATIONS of the following buildings in New York City were built by the engineers of The FOUNDATION COMPANY:

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U. S. Realty Building
Trinity Building
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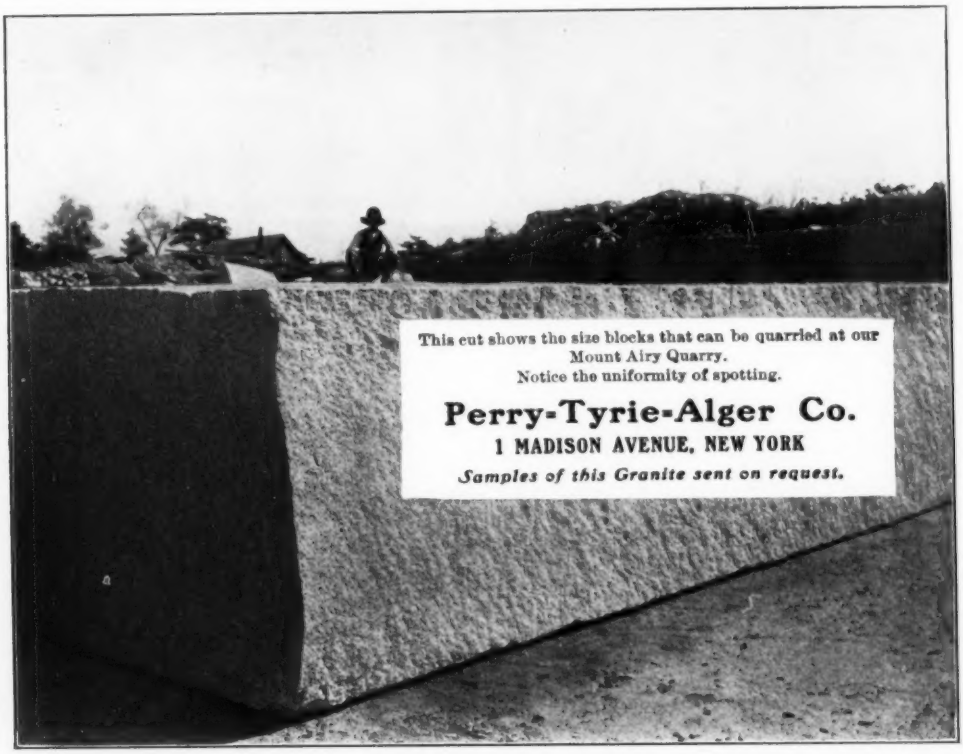
Trust Co. of America
U. S. Express Co. Building
Royal Queen Insurance Bldg.
Seligman Building
Wall St. Exchange Building
42 Broadway "
Empire "
Whitehall "
Broad Exchange "
American Surety "

Standard Oil Building
Johnston Building
Manhattan Life Building
Commercial Cable Annex Bldg.
Washington Life Building
National Park Bank Building
Royal Baking Powder Building
Barclay Building
St. Urban Apartments
Rogers Building
Produce Exchange Bank Bldg.
Municipal Lodging House
Woodhull Building
Griswold "
Roger & Pyatt "



Sound Deafening

To determine how much confined air and what density give best results in material for sound deafening was a difficult problem. Material that is just a little too porous allows the sound waves to pass through it, while that which is a trifle too dense transmits sound waves by its own vibration.

LITH

is the result of a vast amount of experimentation on this subject and has proven by actual test to be the best sound deafener yet produced.

LITH is made of Silica Rock Wool and degummed flax fibre.

Chemical analysis of our Silica Rock Wool shows it to be absolutely free from sulphuric acid and iron oxides, and *permanent* in its chemical composition.

LITH is made in board form in thicknesses from one-half inch to four inches and will always remain uniform in density and composition.

The flax fibre gives sufficient body to hold the Rock Wool firmly so it will not settle, and at the same time gives the composition additional air capacity.

LITH is also an excellent material for heat and cold insulation.

We shall be glad to send a sample of LITH to any Architect free on request.

UNION FIBRE COMPANY, 101 Mechanic St., WINONA, MINN.

Chicago Office, 304 Great Northern Building New York Office, 277 Broadway

Pittsburgh Plate Glass Company

CARRARA GLASS DEPARTMENT

Frick Building, PITTSBURGH, PA. **New York Offices: 1135 Broadway**

PRODUCTS.—CARRARA GLASS, a white, opaque glass, made in thicknesses from ⅛ to 2", and in all sizes, widths and lengths that would be extreme in marble. It is an absolutely sanitary material, homogeneous in structure impervious to attacks of acid or discolorations, and is non-absorbent and will not craze. Manufactured in several finishes: Polished and Honed or Flat finish.

ADAPTABILITY.—Carrara Glass is used extensively for wainscoting and flooring in all classes of buildings. On account of its sanitary properties it is becoming a necessity for wainscoting for operating rooms, toilet rooms, school lavatories and urinal stalls, or wherever an absolutely sanitary condition is required.

COST.—The cost of this material varies according to treatment, just the same as the cost of tile and marble.

INSTALLATION.—Carrara Glass is installed or set in buildings in practically the same manner that marble is. Regular marble setters readily handle the material—shaping, cutting and drilling it as they would marble.

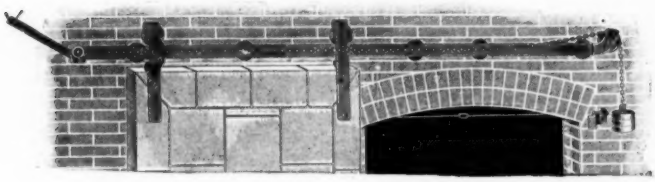
We furnish detail drawings and working plans of perfected lay-outs of all classes of rooms where our material can be used.

SPECIFYING.—In order to insure a perfect installation and prompt delivery of structural glass, specify "Carrara Glass as manufactured by the PITTSBURGH PLATE GLASS COMPANY, Frick Building, Pittsburgh, Pa."

OPERATING AND STERILIZING ROOM AND CREMATORY, ST. LUKE'S HOSPITAL, N. Y.
Walls and floor of Carrara Glass. All internal and external angles of Sanitary Cove.

Fire Doors That Are Good Everyday Doors

Top View showing the position of Door when open.



SIDE VIEW SHOWING HORIZONTAL TRACK

Use fire doors that work right, not only as fire doors, but as doors.

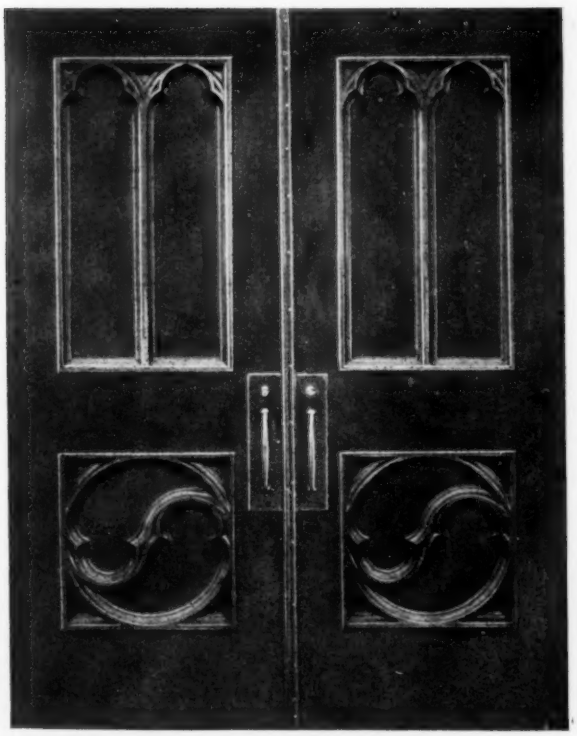
The Prouty Fire Door slides as an ordinary door on a horizontal track and the weight is not attached to the door till the fusible link releases chain.

Notice the curved track that holds door away from wall when open and brings tight against opening when closed.

Made in full accordance with underwriters' specifications.

T. C. PROUTY CO., Ltd., Albion, Mich

NEW YORK CITY	BOSTON, MASS.	SAN FRANCISCO
23 Warren St.	19 Pearl St.	40 Montgomery St.



Richardson Doors

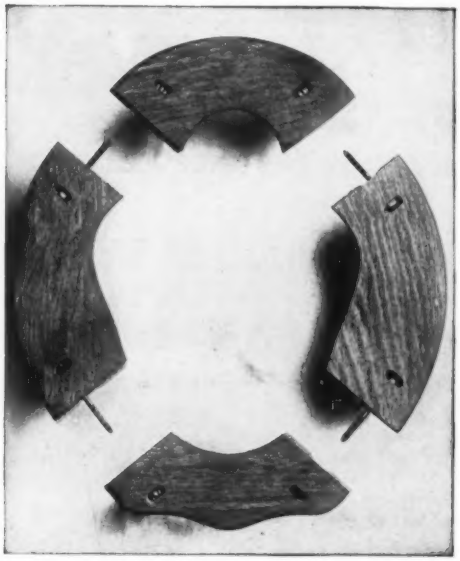
Make Each Room A Separate Building

Economy in maintenance, safety and insurance make Richardson Doors cheaper than wood. They are finished in Antique Copper and Brass Plate, or the Natural Wood Grain. For All Fireproof Buildings.

COPPER ENTRANCE DOORS
QUIRK MEMORIAL, DETROIT
DONALDSON & MEIER, ARCHTS.

THORP FIRE PROOF DOOR CO.

MINNEAPOLIS MINNESOTA



This illustration shows the construction of the

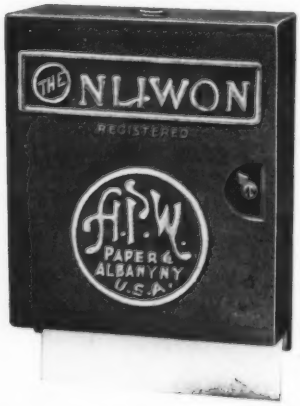
NEVER-SPLIT SEAT

It is built on scientific principles and does not belie its name. *Send for our new Catalogue.*

NEVER-SPLIT SEAT CO., Evansville, Ind.

The "Onliwon"

Toilet Paper Cabinet



Delivers units of two sheets uniformly, invariably and *silently*, eliminating the waste and litter incident to the unprotected roll or package. Nickel plated steel *locked* cabinets for hotel or other public places. Handsomely ornamented metal for residential use.

Sample cabinet with booklet showing **special designs for new construction** will be sent architects or others on application.

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Awarded the Gold Medal at the St. Louis Exposition, 1904, for Superiority of Goods

Eureka Fire Hose Co.

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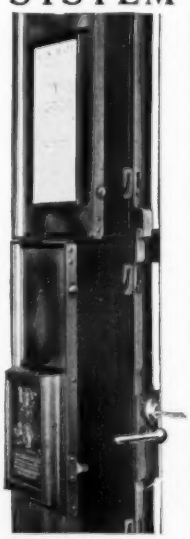
THE CUTLER MAILING SYSTEM

SHOULD BE SPECIFIED BY NAME WHERE THE STANDARD AUTHORIZED MAIL CHUTE EQUIPMENT IS DESIRED.

DESIGNATE "MODEL C" IF THE VERY LATEST AND BEST FORM IS REQUIRED. INTERIOR UNDER GOVERNMENT LOCK, BUT INSTANTLY ACCESSIBLE TO AUTHORIZED PERSONS.

ILLUSTRATED CIRCULARS, SPECIFICATION FORMS, DETAILS, ETC., WILL BE SENT ON APPLICATION TO THE SOLE MAKERS.



MODEL C, OPEN

THE CUTLER MFG. CO.
ROCHESTER, NEW YORK.

THE SCHWAB RESIDENCE — Maurice Hebert, Architect

ATLAS PORTLAND CEMENT USED IN THE CONSTRUCTION OF THIS FINE RESIDENCE

Atlas Portland Cement

The Standard American Brand

ALWAYS UNIFORM

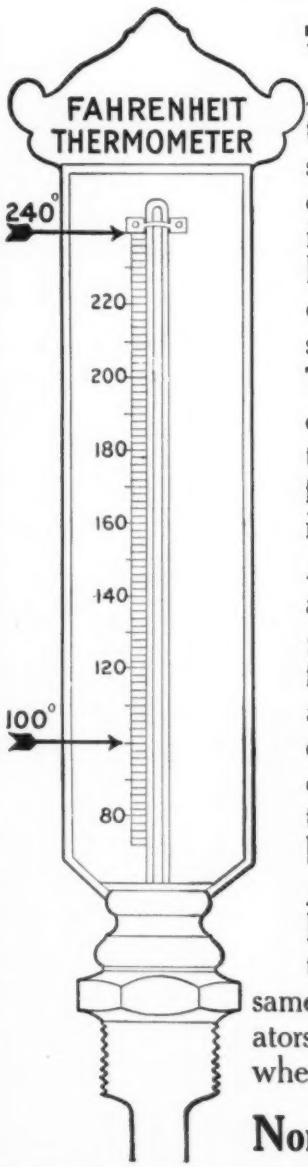
"Concrete Country Residences," our latest book, shows photos and floor plans of about 90 concrete houses, and should be of great value to those who are about to build.

Copies sent, charges paid, upon receipt of $1.00.

The Atlas Portland Cement Company

30 BROAD STREET :: :: NEW YORK

Wasting or Using a Banked Fire



Norwall Vacuum Heating temperature possibilities. From mildest hot water to hottest steam.

As soon as you "bank" the fire in a low pressure steam heating boiler, the water stops boiling and a few minutes later the radiators all over the building are stone cold.

There will be no steam delivered to the radiators again till the fire is forced the next morning.

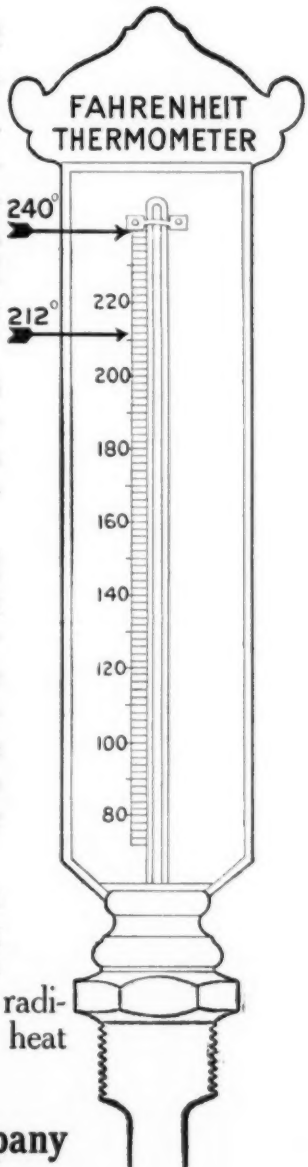
All of the coal burned and all of the heat generated by a slow fire or a banked fire are thrown away, because there is not quite enough heat to keep the water in the boiler boiling.

A Norwall Vacuum Heating System using the same boiler, the same piping and the same radiators does not lose its heat when the fire is banked.

Norwall Mfg. Company

154 LAKE STREET, CHICAGO, ILL.

104 West 42d Street, New York, N. Y.



Steam heating temperature possibilities. Boiling heat or no heat.

Wasting or Using a Banked Fire

Norwall Combined Vacuum and Air Valve.

The banked fire that cannot boil the water in the ordinary low pressure system keeps the same water boiling and sends useful heat (hot vapor) to the radiators as soon as the system is equipped with Norwall Vacuum Valves instead of the ordinary air valves.

Water boils and gives off steam at as low a temperature as 100 degrees when the plant is under vacuum automatically created by the Norwall System.

Think of the comparatively few days when the intense heat of low pressure steam is not too hot.

A Norwall System can give you all the intense heat of low pressure steam ***when you need it,*** but during the majority of the winter days and all of the spring and fall days, when the low temperatures of vacuum heating are all that are necessary for comfort, you are not at the mercy of the boiling heat or no heat of low pressure steam.

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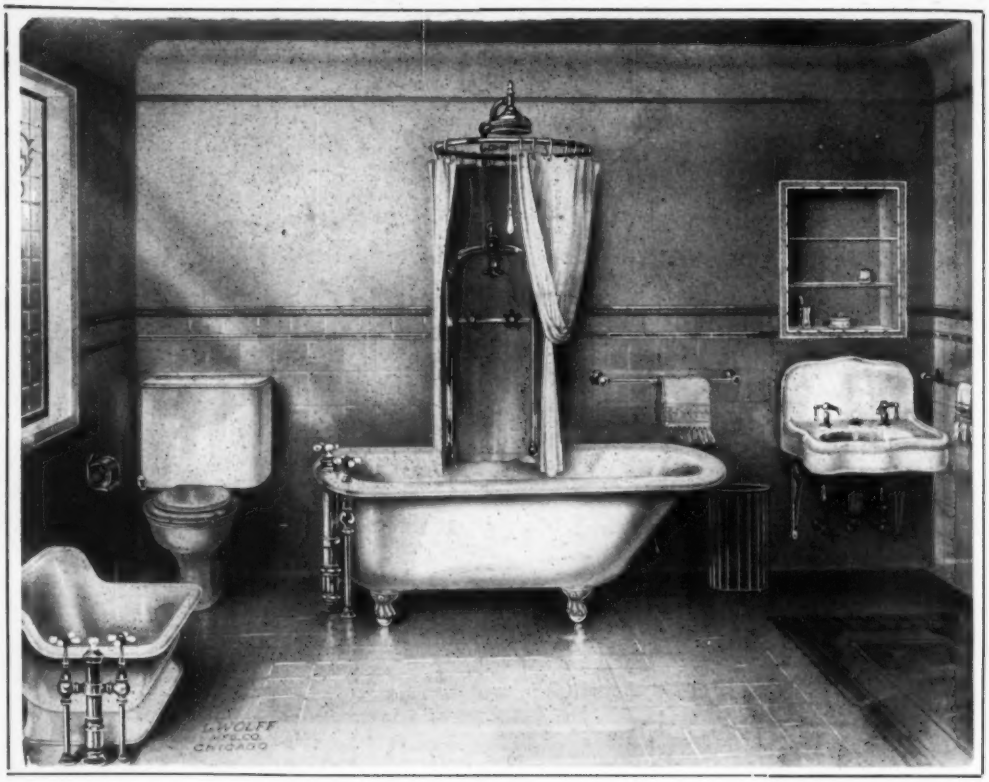

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